THE

LADIES and GENTLEMENS

DIARY,

OR,

ROYAL ALMANACK;

For the Year of our LORD, 1778:

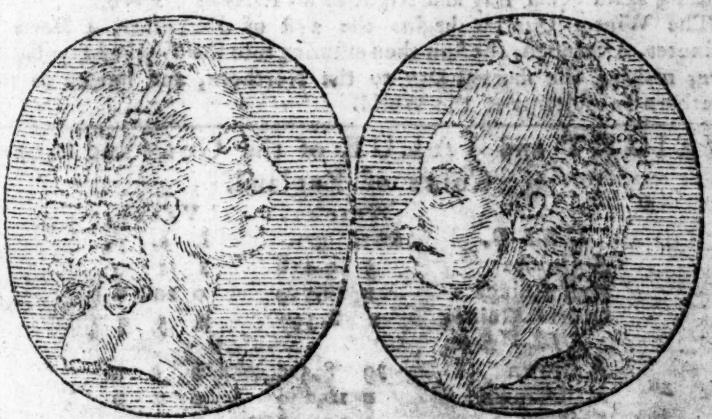
Being the Second after Biſſextile, or Leap Year.

CONTAINING,

Beſides the CALENDAR, a great Variety of Ænigmas, Rebuſes, Mathematical Solutions, &c. &c.

By **REUBEN BURROW,**

Late Aſſiſtant Aſtronomer at the Royal Obſervatory, and Teacher of the Mathematics.



LONDON:

Printed for T. CARNAN, in St. Paul's Church Yard, who diſpoſſeſſed the Stationers Company of the excluſive Privilege of Printing Almanacks, which they had unjuſtly monopolized 170 Years.

ECLIPSES in 1778.

In the courſe of this year there will be Three Eclipſes, Two of the Sun, and One of the Moon, which will happen in the following Order: The Firſt will be a viſible Eclipſe of the Sun on the 24th day of June in the Afternoon, the beginning at Forty-One Minutes after Three; Middle at Thirty-Five Minutes after Four; and the end at Twenty-Seven Minutes after Five, apparent time: The Digits eclipſed $6\frac{1}{6}$ on the Southern limb of the Sun: The Second is a viſible Eclipſe of the Moon on the 4th day of December in the Morning; the beginning at Twenty-Four Minutes after Four, Middle at Thirty-Seven Minutes after Five, and the End at Forty-Nine Minutes after Six, apparent time; the Digits eclipſed $6\frac{1}{4}$ on the Moon's Northern limb. The Third and Laſt is an inviſible Eclipſe of the Sun on the 18th of December, about Ten at Night.

COMMON NOTES, 1778.

Golden Number	12	Dominical Letter	D
Cycle of the Sun	23	Roman Indiction	11
Epact	1	Number of Direction	29

The FOUR QUARTERS of the YEAR.

The Spring Quarter begins this Year the 20th of March, at 10 Minutes after Noon, at which time the Sun enters the *Equinoctial Sign Aries*, making equal Day and Night all the World over.

The Summer Quarter commences the 21ſt Day of June, at 10 Hours 24 Minutes, Forenoon, the Sun then entering into the *Sign Cancer*, making the longeſt Day to all the Northern, and the ſhorteſt to all the Southern Parts of the World.

The Autumnal Quarter begins the 22d Day of September, at 11 Hours 47 Minutes at Night, at which Time the Sun enters *Libra*, making again equal Day and Night to all Parts of the World.

The Winter Quarter begins the 21ſt of December, 4 Hours 5 Minutes, Afternoon, the Sun then entering into the *Tropical Sign Capricorn*, making the ſhorteſt Day to the Northern, and longeſt to the Southern Inhabitants of the World.

WEIGHT and VALUE of the GOLD and SILVER COINS of England.

	WEIGHT.		VALUE.		
GOLD.	dwt.	grs.	l.	s.	d.
A Guinea	5	9,438	1	1	0
Half Guinea	2	16,719	0	10	6
Quarter Guinea	1	8,359	0	5	3
SILVER.					
A Crown	19	8,519	0	5	0
Half Crown	9	16,259	0	2	6
Shilling	3	20,903	0	1	0
Sixpence	1	22,451	0	0	6

Current Gold Coin muſt weigh as follows:

	dwt.	grs.
Guineas	5	8
Half Guineas	2	16
Quarter Guineas	1	8

First Quarter 6 day 8 h. 33 m. morning
Full Moon 13 day 1 h. 33 m. morning
Last Quarter 20 day 1 h. 19 m. afternoon
New Moon 28 day 2 h. 46 m. afternoon

Sun enters Aquarius 19d. 8h. 46m. Apparent time.

1	Th	Circumcision	8	5	3	55	22	59	6 A	34	4
2	F	Venus rises 6. 38 m.	8	4	3	56	22	54	7	44	5
3	S		8	3	3	57	22	48	9	0	6
4	D	2 S. aft. Chriſt.	8	2	3	58	22	42	10	16	7
5	M	*Old Chriſtmas Day*	8	1	3	59	22	35	11	35	8
6	Tu	Epiphany. *Twelfth-Day*	8	1	3	59	22	28	Morn.		9
7	W	*Julianus*	8	0	4	0	22	20	0	55	10
8	Th	*Lucian*	7	59	4	1	22	12	2	15	11
9	F	*Aldebaran*, So. 8. 57	7	58	4	2	22	3	3	38	12
10	S		7	57	4	3	21	54	4	59	13
11	D	1 S. aft. Epip.	7	56	4	4	21	45	6	16	14
12	M	*Plow Mond. O. N. Y. d.*	7	55	4	5	21	35	☽	riſes	15
13	Tu	Hilary. Camb. T. b.	7	54	4	6	21	25	4 a	39	16
14	W	Oxford Term begins	7	53	4	7	21	14	5	55	17
15	Th	Exchequer opens	7	51	4	9	21	3	7	12	18
16	F	*Jupiter* riſes 6. 35 A.	7	50	4	10	20	52	8	25	19
17	S	*Old Twelfth Day.*	7	49	4	11	20	40	9	36	20
18	D	2 S. aft. Epip. Priſca.	7	48	4	12	20	28	10	44	21
19	M	Q. Charl. birth-day kept	7	46	4	14	20	15	11	53	22
20	Tu	*Fabian* B. & M. In 8 d. Hil.	7	45	4	15	20	2	Morn.		23
21	W	*Agnes* [1 Ret.	7	44	4	16	19	49	1	0	24
22	Th	*Vincent*	7	42	4	18	19	35	2	5	25
23	F	Hilary Term begins	7	41	4	19	19	21	3	13	26
24	S		7	39	4	21	19	6	4	17	27
25	D	3 S. aft. Ep. *Co. St. Paul*	7	38	4	22	18	52	5	20	28
26	M	*Saturn* riſes 1. 35 M.	7	36	4	24	18	37	6	18	29
27	Tu	Fr. A. Fr. b. From Hil. in	7	35	4	25	18	21	7	7	30
28	W	*Sirius* So. 9. 48. [15 d. 2 Ret	7	33	4	27	18	5	☽	ſets	1
29	Th		7	31	4	29	17	49	5 a	24	2
30	F	K. Char. I. Martyr.	7	30	4	30	17	33	6	40	3
31	S		7	28	4	32	17	16	7	57	4

Days	L. of D.	Days inc	D. breaks	Sun Eaſt	Tw. ends	Cl. bef. S.	7 Stars So.
1	7 51	0 7	5 59	4 41	6 1	4 15	8 A 45
6	7 58	0 14	5 56	4 43	6 4	6 32	8 23
11	8 8	0 24	5 53	4 46	6 7	8 36	8 1
16	8 20	0 36	5 48	4 50	6 12	10 24	7 40
21	8 32	0 48	5 43	4 54	6 17	11 55	7 19
26	8 48	1 4	5 37	4 58	6 23	13 7	6 58

First Quarter 4 day 4 h. 37 m. afternoon
Full Moon 11 day 2 h. 46 m. afternoon
Last Quarter 19 day 10 h. 45 m. night
New Moon 27 day 4 h. 47 m. morning

Sun enters Pisces. 17d. 23h. 39m. Apparent time.

D M	D W	Sundays, Holidays, &c.	Sun rises	Sun sets	Sun decl. S	☽ rises & sets	☽'s age
1	D	4 S. aft. Epiphany	7 26	4 34	16 59	9 A 10	5
2	M	Purif. V. Mary. Candle. d.	7 25	4 35	16 41	10 34	6
3	Tu	*Blase*. Mor. Purif. 3 Ret.	7 23	4 37	16 24	11 55	7
4	W		7 21	4 39	16 6	Morn.	8
5	Th	*Agatha*	7 19	4 41	15 48	1 17	9
6	F		7 18	4 42	15 29	2 37	10
7	S	Venus rises 6. 59 M.	7 16	4 44	15 10	3 53	11
8	D	5 S. aft. Epip.	7 14	4 46	14 51	5 4	12
9	M	In 8 days of Pur. 4 Ret.	7 12	4 48	14 32	6 6	13
10	Tu	*Capella* South 7. 22	7 10	4 50	14 13	6 49	14
11	W		7 9	4 51	13 53	☽ rises	15
12	Th	Hilary Term ends	7 7	4 53	13 33	5 a 57	16
13	F	Old Candlemas day	7 5	4 55	13 13	7 10	17
14	S	*Valentine*	7 3	4 57	12 52	8 23	18
15	D	Septuagesima Sunday	7 1	4 59	12 32	9 31	19
16	M		6 59	5 1	12 11	10 41	20
17	Tu		6 57	5 3	11 50	11 49	21
18	W	*Capella* South 6. 51	6 56	5 4	11 29	Morn.	22
19	Th	Mars sets 7. 31 A.	6 54	5 6	11 7	0 57	23
20	F	*Sirius* South 8. 18	6 52	5 8	10 46	2 3	24
21	S		6 50	5 10	10 24	3 6	25
22	D	Sexagesima Sunday	6 48	5 12	10 2	4 5	26
23	M		6 46	5 14	9 40	4 58	27
24	Tu	S. Matth. P. Ad. Fr. born	6 44	5 16	9 18	5 44	28
25	W	Camb. Term divides m.	6 42	5 18	8 56	6 22	29
26	Th	Saturn rises 11. 26 Nig.	6 40	5 20	8 33	☽ sets	1
27	F	*Aldebaran* So. 5. 39	6 38	5 22	8 11	5 a 40	2
28	S	Hare hunting goes out	6 36	5 24	7 48	7 0	3

Days.	L. of D.	Days inc.	☽ breaks	Sun East.	Tw. end.	Cl. bef S	7 Stars go.
1	9 7	1 23	5 29	5 4	6 31	14 8	6 A 33
6	9 24	1 40	5 21	5 9	6 39	14 34	6 13
11	9 43	1 59	5 13	5 15	6 47	14 41	5 53
16	10 2	2 18	5 5	5 22	6 55	14 28	5 34
21	10 20	2 36	4 56	5 26	7 4	13 58	5 14
26	10 40	2 56	4 47	5 33	7 13	13 12	4 55

First Quarter 6 day 0 h. 5 m. morning
Full Moon 13 day 5 h. 6 m. morning
Last Quarter 21 day 7 h. 15 m. morning
New Moon 28 day 4 h. 0 m. afternoon

S. enters Aries.
20d. 0h. 10m.
Apparent time.

1	D	**Shrove Sunday.** *David*	6	34	5	26	7	25	8 A	22	4
2	M	Chad.	6	32	5	28	7	3	9	45	5
3	Tu	**Shrove Tuesday**	6	30	5	30	6	40	11	7	6
4	W	**Ash Wednesday**	6	28	5	32	6	17	Morn.		7
5	Th		6	26	5	34	5	53	0	30	8
6	F		6	24	5	36	5	30	1	47	9
7	S	*Perpetua*	6	22	5	38	5	7	3	1	10
8	D	**1 Sunday in Lent**	6	20	5	40	4	43	4	2	11
9	M	Mars sets 7. 39 Af.	6	18	5	42	4	20	4	51	12
10	Tu	Procyon South 8. 4	6	16	5	44	3	57	5	27	13
11	W	**Ember Week**	6	14	5	46	3	33	5	57	14
12	Th	*Gregory* M.	6	12	5	48	3	9	☽ rises		15
13	F		6	10	5	50	2	46	6 A	8	16
14	S	Sirius So. 6. 56	6	8	5	52	2	22	7	21	17
15	D	**2 Sunday in Lent**	6	6	5	54	1	59	8	30	18
16	M		6	4	5	56	1	35	9	39	19
17	Tu	*St. Patrick*	6	2	5	58	1	11	10	48	20
18	W	*Edward K. W. S.*	6	0	6	0	0	48	11	55	21
19	Th	Jupiter South 9 24 N.	5	59	6	1	0	24	Morn.		22
20	F	Equal Day and Night	5	57	6	3	0	0	1	0	23
21	S	Benedict Abbot.	5	55	6	5	N	24	2	3	24
22	D	**3 Sunday in Lent**	5	53	6	7	0	47	2	57	25
23	M		5	51	6	9	1	11	3	43	26
24	Tu		5	49	6	11	1	34	4	24	27
25	W	**Lady-Day, or Annun.**	5	47	6	13	1	58	4	56	28
26	Th	Saturn rises 7. 16	5	45	6	15	2	21	5	24	29
27	F	Sirius So. 6. 9	5	43	6	17	2	45	5	48	30
28	S		5	41	6	19	3	8	☽ sets		1
29	D	**4 S. in Lent. Mid-Lent S.**	5	39	6	21	3	32	7 A	29	2
30	M		5	37	6	23	3	55	8	56	3
31	Tu		5	35	6	25	4	18	10	21	4

Days	L. of D.	Days inc.	D breaks	Sun East	I w. ends	Cl. bef. S.	7 Stars So.
1	10 52	3 8	4 41	5 36	7 19	12 38	4 A44
6	11 12	3 28	4 31	5 42	7 29	11 30	4 26
11	11 31	3 47	4 21	5 49	7 39	10 13	4 7
16	11 51	4 7	4 10	5 55	7 50	8 47	3 49
21	12 10	4 26	3 59	6 2	8 1	7 16	3 31
26	12 30	4 46	3 47	6 8	8 13	5 43	3 13

First Quarter 4 day 7 h. 50 m. morning
Full Moon 11 day 8 h. 21 m. afternoon
Last Quarter 20 day 0 h. 54 m. afternoon
New Moon 27 day 0 h. 59 m. morning

Sun enters Taurus. 19d. 13h. 2m. Apparent time.

1	W		5 33	6 27	4 41	11 A 43	5
2	Th	Sirius So. 5. 51	5 31	6 29	5 4	Morn.	6
3	F	*R. Biſhop Chicheſter*	5 29	6 31	5 27	1 1	7
4	S	*St. Ambroſe*	5 27	6 33	5 50	2 7	8
5	D	5 S. in Lent. *Old Lady-day*	5 25	6 35	6 13	2 58	9
6	M		5 23	6 37	6 36	3 40	10
7	Tu	Mars ſets 8. 1 N.	5 21	6 39	6 58	4 12	11
8	W		5 19	6 41	7 21	4 39	12
9	Th		5 17	6 43	7 43	4 58	13
10	F	Camb. Term ends	5 15	6 45	8 5	5 15	14
11	S	Oxf. Term ends	5 13	6 47	8 27	5 33	15
12	D	Palm Sunday	5 11	6 49	8 49	☽ riſes	16
13	M	Jupiter So. 7. 50 A.	5 9	6 51	9 11	7 A 34	17
14	Tu	Regulus So. 8. 24	5 8	6 52	9 32	8 43	18
15	W	Clock with Sun	5 6	6 54	9 54	9 50	19
16	Th	*Maund. Thurſday*	5 4	6 56	10 15	10 57	20
17	F	Good Friday	5 2	6 58	10 36	Morn.	21
18	S		5 0	7 0	10 57	0 58	22
19	D	Eaſter Sunday. *Alphege*	4 58	7 2	11 18	1 48	23
20	M	Eaſter Monday	4 56	7 4	11 39	2 30	24
21	Tu	Eaſter Tueſday	4 54	7 6	11 59	3 5	25
22	W		4 53	7 7	12 19	3 33	26
23	Th	St. George	4 51	7 9	12 39	3 57	27
24	F	Saturn So. 34m. aft. mid.	4 49	7 11	12 59	4 19	28
25	S	St. Mark. Prs. Mary born	4 47	7 13	13 18	4 37	29
26	D	1 S. after Eaſter. Low S.	4 45	7 15	13 38	☽ ſets	1
27	M	Victory of Culloden	4 43	7 17	13 57	7 A 58	2
28	Tu		4 42	7 18	14 16	9 26	3
29	W	Oxf. and Camb. T. beg.	4 40	7 20	14 35	10 52	4
30	Th	Regulus So. 7. 24	4 38	7 22	14 53	Morn.	5

Days	D. of D.	Days inc.	D. breaks	Sun Eaſt	Tw. ends	El. bef. S.	Stars be.
1	12 54	5 10	3 32	6 15	8 28	3 53	2 A 51
6	13 14	5 30	3 19	6 21	8 41	2 23	2 33
11	13 33	5 49	3 6	6 27	8 54	0 57	2 14
16	13 51	6 7	2 52	6 33	9 8	0 A 21	1 56
21	14 11	6 27	2 37	6 39	9 23	1 29	1 37
26	14 30	6 46	2 22	6 45	9 38	2 26	1 17

First Quarter 3 day 4 h. 28 m. afternoon
Full Moon 11 day 0 h. 7 m. afternoon
Last Quarter 19 day 2 h. 37 m. afternoon
New Moon 26 day 8 h. 34 m. morning

Sun enters Gemini.
20d. 13h. 42m.
Apparent time.

1	F	St. Philip and James	4 36	7 24	15 11	0 M	4	6
2	S		4 35	7 25	15 29	1	2	7
3	D	2 S. aft. East. *Inv. of Cross*	4 33	7 27	15 47	1	49	8
4	M	From East. in 15 days 1	4 31	7 29	16 4	2	23	9
5	Tu	Spica South 10. 17 [Ret.	4 29	7 31	16 21	2	49	10
6	W	*John E. P. Lat.* E. Ter. b.	4 28	7 32	16 38	3	10	11
7	Th	Venus sets 8. 39 A	4 26	7 34	16 55	3	29	12
8	F	Regulus So. 6. 54	4 24	7 36	17 11	3	46	13
9	S		4 23	7 37	17 27	4	2	14
10	D	3 S. after Easter	4 21	7 39	17 43	4	18	15
11	M	From East. in 3 weeks 2	4 20	7 40	17 58	☽ rises		16
12	Tu	*Old May-day.* [Ret.	4 18	7 42	18 14	8 A	48	17
13	W	Jupiter sets 1. 33 M	4 17	7 43	18 28	9	52	18
14	Th		4 15	7 45	18 43	10	54	19
15	F	Arcturus South 10 34	4 14	7 46	18 57	11	49	20
16	S		4 12	7 48	19 11	Morn.		21
17	D	4 S. after Easter	4 11	7 49	19 25	0	31	22
18	M	From East. in 1 mo. 3 Ret	4 9	7 51	19 38	1	8	23
19	Tu	Q. Cha. b. 1744 *Dunst.*	4 8	7 52	19 51	1	38	24
20	W	Saturn So. 10. 45 N	4 7	7 53	20 3	2	3	25
21	Th		4 5	7 55	20 16	2	24	26
22	F	Prs. Eliz. born 1770	4 4	7 56	20 28	2	43	27
23	S		4 3	7 57	20 39	3	3	28
24	D	Rogation Sunday	4 1	7 59	20 50	3	22	29
25	M	From East. in 5 weeks 4	4 0	8 0	21 1	3	48	1
26	Tu	*Augustin. All twil.* [Ret.	3 59	8 1	21 12	☽ sets		2
27	W	*Venerable Bede*	3 58	8 2	21 22	8 A	22	3
28	Th	Ascens. day. Holy Thurs.	3 57	8 3	21 32	9	42	4
29	F	K. Ch. II. Rest. On the	3 56	8 4	21 41	10	52	5
30	S	[mor. of Ascens. 5 Ret.	3 55	8 5	21 50	11	44	6
31	D	Sunday after Ascension	3 54	8 6	21 59	Morn.		7

Days	L. of D.	Days In.	D. breaks	Sun East	Tw. ends	Cl. aft. S.	7 Stars So.
1	14 47	7 3	2 5	6 50	9 55	3 10	1 A 0
6	15 5	7 21	1 47	6 55	10 13	3 41	0 40
11	15 21	7 37	1 26	7 0	10 34	3 58	0 21
16	15 36	7 52	1 6	7 4	10 54	4 2	0 1
21	15 50	8 6	0 27	7 8	11 33	3 50	11 M 41
26	16 2	8 18	No Night	7 12	No Night	3 25	11 23

First Quarter 2 day 2 h. 34 m. morning
Full Moon 10 day 3 h. 50 m. morning
Last Quarter 18 day 0 h. 25 m. morning
New Moon 24 day 3 h. 37 m. afternoon

S. enters Cancer
20d. 22h. 24m.
Apparent time.

1	M	Nicomede. **Term ends**	3 53	8 7	22 7	0 M 56	8
2	Tu		3 52	8 8	22 15	1 16	9
3	W	Camb. Term divid. [ends	3 51	8 9	22 22	1 36	10
4	Th	**K. G. III. b. 1738 Ox. T**	3 50	8 10	22 29	1 51	11
5	F	**Pr. Er. Aug. b.** *Boniface*	3 49	8 11	22 36	2 9	12
6	S	Arcturus South 9. 6	3 49	8 11	22 42	2 29	13
7	**D**	**Whit-Sunday**	3 48	8 12	22 48	2 42	14
8	M	**Whit-Monday**	3 47	8 13	22 54	3 3	15
9	Tu	**Whit-Tuesday**	3 47	8 13	22 59	3 25	16
10	W	**Prs. Amelia b. o. Em. Week**	3 46	8 14	23 3	☽ rites	17
11	Th	**St. Barnabas**	3 46	8 14	23 8	9 A 43	18
12	F		3 45	8 15	23 12	10 30	19
13	S	Venus sets 9. 55 N.	3 45	8 15	23 15	11 7	20
14	**D**	**Trinity Sunday**	3 44	8 16	23 18	11 39	21
15	M	Cl with S. On mor. H Tr.	3 44	8 16	23 21	Morn.	22
16	Tu	Jupiter S. 4. 1 A [1 Ret	3 44	8 16	23 23	0 5	23
17	W	*St. Alban* Oxf. Term beg	3 43	8 17	23 25	0 25	24
18	Th	*Corpus Christi.*	3 43	8 17	23 26	0 44	25
19	F	Trinity Term begins	3 43	8 17	23 27	1 1	26
20	S	*K. Edw. K. W. S.*	3 43	8 17	23 28	1 20	27
21	**D**	**1 S. aft. Trin.** Long. day	3 43	8 17	23 28	1 42	28
22	M	In 8 days Holy Trin 2 Ret	3 43	8 17	23 28	2 7	29
23	Tu		3 43	8 17	23 27	2 40	30
24	W	**St John Bap. Midsum day**	3 43	8 17	23 26	☽ sets	1
25	Th	Jupiter sets 10 49 N. [☉ E	3 43	8 17	23 25	9 A 27	2
26	F		3 44	8 16	23 23	10 9	3
27	S	Arcturus So. 7. 39	3 44	8 16	23 20	10 48	4
28	**D**	**2 S aft. Trinity**	3 44	8 16	23 18	11 15	5
29	M	**St. Peter & Paul.** In 15 d.	3 45	8 15	23 15	11 35	6
30	Tu	[of H Trin. 3 Ret	3 45	8 15	23 11	11 53	7

Days	L. of D.	Days inc.	D. breaks	Sun East	Tw. ends	Cl. aft. S.	7 Stars So.
1	16 15	8 31	No real night, but constant twilight.	7 15	No real night, but constant twilight.	2 38	10 M 57
6	16 23	8 39		7 18		1 49	10 36
11	16 29	8 45		7 19		0 53	10 16
16	16 33	8 49		7 21		bef. 9	9 55
21	16 34	8 50		7 21		1 14	9 34
26	16 33	dec. 2		7 21		2 18	9 13

First Quarter 1 day 2 h. 48 m. afternoon
Full Moon 9 day 6 h. 46 m. afternoon
Last Quarter 17 day 7 h. 43 m. morning
New Moon 23 day 11 h. 7 m. night
First Quarter 31 day 5 h. 42 m. morning

Sun enters Leo. 22d. 9h. 7m. Apparent time.

1	W	*St. Marnat*	3	46	8	14	23	7	Morn.		8
2	Th	*Visit. B. V. M.*	3	46	8	14	23	3	0	S	9
3	F	Dies Comitior.	3	47	8	13	22	58	0	25	10
4	S	*Tran. St Mart. T.*	3	47	8	13	22	53	0	41	11
5	D	**3 S. aft. Trin.** *O. Mid. d.*	3	48	8	12	22	47	1	1	12
6	M	In 3 W. H. Trin. 4 Ret.	3	49	8	11	22	42	1	23	13
7	Tu	*Tho a Becket* Camb. Com.	3	49	8	11	22	35	1	51	14
8	W	**Term ends**	3	50	8	10	22	29	2	26	15
9	Th	Lyra South 11. 12	3	51	8	9	22	21	☽ rises		16
10	F	Camb. Term ends	3	52	8	8	22	14	9	A 3	17
11	S		3	53	8	7	22	6	9	36	18
12	D	**4 S. aft. Trinity**	3	54	8	6	21	58	10	5	19
13	M	Oxford Act	3	55	8	5	21	49	10	24	20
14	Tu	Jupiter sets 9 37 N.	3	56	8	4	21	40	10	45	21
15	W	*St. Swithin*	3	57	8	3	21	31	11	5	22
16	Th		3	58	8	2	21	21	11	22	23
17	F	Autares So 8 27	3	59	8	1	21	11	11	42	24
18	S	Oxford Term ends	4	0	8	0	21	1	Morn.		25
19	D	**5 S. aft. Trinity**	4	1	7	59	20	50	0	4	26
20	M	*Margaret V. and M.*	4	3	7	57	20	39	0	32	27
21	Tu		4	4	7	56	20	27	1	6	28
22	W	*St. Mary Magdalen*	4	5	7	55	20	15	1	58	29
23	Th		4	7	7	53	20	3	☽ sets		1
24	F		4	8	7	52	19	50	8	A 41	2
25	S	**St. James**	4	9	7	51	19	38	9	10	3
26	D	**6 S. aft. Trinity** *St. Anne*	4	11	7	49	19	24	9	35	4
27	M	Saturn sets 11. 1 N.	4	12	7	48	19	11	9	55	5
28	Tu		4	14	7	46	18	57	10	12	6
29	W	Autares So 7 39	4	15	7	45	18	43	10	28	7
30	Th	**Dog days begin**	4	17	7	43	18	28	10	46	8
31	F		4	18	7	42	18	14	11	4	9

Days	L. of D.		Days de		D. breaks	Sun Eaſt		Tw. ends		Cl. bef. S.		7 Stars So	
1	16	29	0	5		7	19			3	19	8 M	53
6	16	22	0	12	No real	7	18	No real		4	13	8	32
11	16	14	0	20	Night.	7	15	Night.		4	58	8	11
16	16	4	0	30		7	12			5	32	7	51
21	15	52	0	42	0	7	7	9	11	53	5	54	7	31
26	15	37	0	57	0	51	7	5	11	3	6	2	7	11

Full Moon 8 day 8 h. 25 m. afternoon
Laſt Quarter 15 day 1 h. 30 m. afternoon
New Moon 22 day 8 h. 4 m. morning
Firſt Quarter 29 day 11 h. 14 m. night

Sun enters Virgo.
22d. 15h. 28m.
Apparent time.

1	S	Lammas-day	4 20	7 40	17 59	11 A	24	10
2	D	7 Sund. aft. Trinity	4 21	7 39	17 43	11	50	11
3	M		4 23	7 37	17 28	Morn.		12
4	Tu		4 24	7 36	17 12	0	22	13
5	W	Lyra So. 9. 26.	4 26	7 34	16 55	1	3	14
6	Th	*Transfiguration*	4 28	7 32	16 39	1	54	15
7	F	*Name of Jeſus*	4 29	7 31	16 22	2	54	16
8	S		4 31	7 29	16 5	☽	riſes	17
9	D	8 S. aft. Trinity	4 33	7 27	15 48	8 A	33	18
10	M	St. Lawrence	4 35	7 25	15 30	8	53	19
11	Tu	Prs. Brunſ. born 1737	4 36	7 24	15 13	9	11	20
12	W	Pr. of Wales bo. 1762 Old	4 38	7 22	14 55	9	28	21
13	Th	Mars ri. 2. 36m [Lam. d.	4 40	7 20	14 36	9	48	22
14	F		4 41	7 19	14 18	10	9	23
15	S	*Aſſumption Virgin Mary*	4 43	7 17	13 59	10	35	24
16	D	9 S. aft. Trin. Pr Fred	4 45	7 15	13 40	11	8	25
17	M	[born 1763	4 47	7 13	13 21	11	49	26
18	Tu		4 49	7 11	13 2	Morn.		27
19	W	Lyra South 8. 32	4 50	7 10	12 42	0	46	28
20	Th		4 52	7 8	12 22	1	56	29
21	F	*Athanaſius.* Pr. Wm. Hen	4 54	7 6	12 2	3	12	1
22	S	[bo. 1765	4 56	7 4	11 42	☽	ſets	2
23	D	10 S. aft. Trinity	4 58	7 2	11 22	8 A	2	3
24	M	St. Bartholomew	5 0	7 0	11 1	8	20	4
25	Tu	Saturn ſets 9. 13N	5 1	6 59	10 41	8	37	5
26	W		5 3	6 57	10 20	8	54	6
27	Th		5 5	6 55	9 59	9	11	7
28	F	*St. Auguſtin*	5 7	6 53	9 37	9	31	8
29	S	*St. John Baptiſt beh.*	5 9	6 51	9 16	9	56	9
30	D	11 S. aft. Trinity	5 11	6 49	8 55	10	25	10
31	M	Clock with Sun	5 13	6 47	8 33	11	3	11

Days	L. of D.	Days dec.	D. breaks	Sun Eaſt	Tw. ends	l. bef. S.	♈ Stars So.
1	15 21	1 13	1 27	7 0	10 33	5 52	6 M 48
6	15 5	1 29	1 43	6 55	10 17	5 26	6 29
11	14 48	1 46	2 5	6 50	9 55	4 46	6 9
16	14 30	2 4	2 21	6 45	9 39	3 52	5 51
21	14 12	2 22	2 37	6 39	9 23	2 46	5 32
26	13 53	2 41	2 51	6 33	9 9	1 28	5 14

Full Moon 6 day 8 h. 43 m. afternoon
Last Quarter 13 day 7 h. 9 m. afternoon
New Moon 20 day 7 h. 18 m. afternoon
First Quarter 28 day 6 h. 32 m. afternoon

Sun enters Libra. 22d. 11h. 47m. Apparent time.

1	Tu	*Giles*	5 15	6 45	8 11	11 A	50	12
2	W	London burnt 1666 ☉ S	5 17	6 43	7 49	Morn.		13
3	Th		5 19	6 41	7 27	0	47	14
4	F	Aquilæ So. 8. 46	5 20	6 40	7 5	1	52	15
5	S		5 22	6 38	6 43	3	4	16
6	D	12 S. aft. Trinity	5 24	6 36	6 20	☽ rises		17
7	M	Eunurchus. Dog-days E.	5 26	6 34	5 58	7 A	24	18
8	Tu	*Nativity V. Mary*	5 28	6 32	5 35	7	42	19
9	W	Venus sets 7. 42 N.	5 30	6 30	5 13	8	0	20
10	Th		5 32	6 28	4 50	8	22	21
11	F	Fomalhaut South 11 24	5 34	6 26	4 27	8	45	22
12	S		5 36	6 24	4 4	9	16	23
13	D	13 S. aft. Trinity	5 38	6 22	3 41	9	55	24
14	M		5 40	6 20	3 18	10	47	25
15	Tu		5 42	6 18	2 55	11	51	26
16	W	Ember Week	5 44	6 16	2 32	Morn.		27
17	Th	*Lambert*	5 46	6 14	2 8	1	2	28
18	F		5 48	6 12	1 45	2	24	29
19	S	Mars rises 2. 35 M	5 50	6 10	1 22	3	43	30
20	D	14 S. aft. Trinity	5 52	6 8	0 58	☽ sets		1
21	M	St. Matthew	5 54	6 6	0 35	6 A	50	2
22	Tu	K. Geo III. Cor. 1761,	5 56	6 4	0 12	7	7	3
23	W	[Equal Day & Night	5 57	6 3	S 12	7	25	4
24	Th		5 59	6 1	0 35	7	42	5
25	F	Saturn sets 7. 27 N	6 1	5 59	0 59	8	6	6
26	S	*St. Cyprian*	6 3	5 57	1 22	8	31	7
27	D	15 S. aft. Trinity	6 5	5 55	1 46	9	7	8
28	M		6 7	5 53	2 10	9	49	9
29	Tu	St. Mich. Fes. R. b. Hare h	6 9	5 51	2 33	10	41	10
30	W	*St. Jerome* [comes in	6 11	5 49	2 56	11	41	11

Days	L. of D.	Days dec.	D. breaks	Sun East	Tw. ends	Cl. aft. S.	7 Stars	o
1	13 31	3 3	3 8	6 26	8 52	0 18	4 M	52
6	13 11	3 23	3 21	6 20	8 39	1 55	4	34
11	12 52	3 42	3 34	6 14	8 26	3 37	4	16
16	12 32	4 2	3 46	6 8	8 14	5 22	3	58
21	12 13	4 21	3 57	6 2	8 3	7 6	3	40
26	11 53	4 41	4 9	5 56	7 51	8 48	3	22

Full Moon	6 day	8 h. 1 m.	morning
Last Quarter	13 day	1 h. 47 m.	morning
New Moon	20 day	9 h. 30 m.	morning
First Quarter	28 day	2 h. 1 m.	afternoon

Sun enters Scorpio.
22d. 19h. 36m.
Apparent time.

1	Th	*Remigius*	6	13	5	47	3	19	Morn.		12
2	F		6	15	5	45	3	43	0	52	13
3	S	Fomalhaut South 10 6	6	17	5	43	4	6	2	5	14
4	**D**	**16 S. aft. Trinity**	6	19	5	41	4	29	3	24	15
5	M		6	21	5	39	4	52	4	44	16
6	Tu	*Faith*	6	23	5	37	5	15	☽ rises		17
7	W	Venus sets 6. 53 N	6	25	5	35	5	38	6 A	32	18
8	Th		6	27	5	33	6	1	6	57	19
9	F	*St. Denys*	6	29	5	31	6	24	7	26	20
10	S	*O. Mich. d.* Oxf. & Cam	6	31	5	29	6	47	8	1	21
11	**D**	**17 S. aft. Tr.** [Terms beg	6	33	5	27	7	10	8	50	22
12	M		6	35	5	25	7	32	9	49	23
13	Tu	*Tr. K. Ed. Confessor*	6	37	5	23	7	55	11	0	24
14	W	Mars rises 2. 34 M	6	39	5	21	8	17	Morn.		25
15	Th		6	41	5	19	8	40	0	15	26
16	F		6	43	5	17	9	2	1	35	27
17	S	*Ethelred Virg.*	6	45	5	15	9	24	2	52	28
18	**D**	**18 S. aft. Trin. St. Luke**	6	46	5	14	9	46	4	8	29
19	M		6	48	5	12	10	7	5	21	1
20	Tu		6	50	5	10	10	29	☽ sets		2
21	W		6	52	5	8	10	51	5 A	54	3
22	Th		6	54	5	6	11	12	6	14	4
23	F		6	56	5	4	11	33	6	39	5
24	S	[Acceſſ. *Criſpin*	6	58	5	2	11	54	7	8	6
25	**D**	**19 S. aft. Trin. K. Geo. III**	7	0	5	0	12	15	7	48	7
26	M	**K. Geo. III. Procl. 1760**	7	1	4	59	12	35	8	35	8
27	Tu		7	3	4	57	12	56	9	31	9
28	W	**St. Simon and Jude**	7	5	4	55	13	16	10	39	10
29	Th		7	7	4	53	13	36	11	47	11
30	F	Fomalhaut South 8 24	7	9	4	51	13	56	Morn.		12
31	S		7	11	4	49	14	15	1	3	13

Days	L. of D	Days of	D. breaks	Sun East	Tw. ends	Cl. aft. S	☿ Stars &c.
1	11 33	5 1	4 20	5 49	7 40	10 25	3 M 4
6	11 14	5 20	4 30	5 43	7 30	11 56	2 45
11	10 54	5 40	4 40	5 37	7 20	13 16	2 27
16	10 35	5 59	4 49	5 31	7 11	14 24	2 8
21	10 16	6 18	4 59	5 25	7 2	15 17	1 50
26	9 57	6 37	5 7	5 19	6 53	15 53	1 31

Full Moon 4 day 0 h. 40 m. afternoon
Last Quarter 11 day 10 h. 26 m. night
New Moon 19 day 2 h. 46 m. morning
First Quarter 27 day 7 h. 52 m. morning

S. ent. Sagittarius
21d. 15h. 53m.
Apparent time.

1	D	**20 S. aft. Trin. All Saints**	7	12	4	48	14	34	2 M	19	14
2	M	**Pr. Ed. bo. 1767** All Souls	7	14	4	46	14	53	3	39	15
3	Tu	Mor. of all Souls 1 Ret.	7	16	4	44	15	12	4	59	16
4	W		7	18	4	42	15	31	☽	rises	17
5	Th	**Powder Plot 1605. O. S.**	7	20	4	40	15	49	5 A	25	18
6	F	**Mich Ter. beg** *Leonard.*	7	21	4	39	16	7	6	0	19
7	S	**Duke of Cumb. bo. 1745**	7	23	4	37	16	25	6	43	20
8	D	**21 S. aft Tri. Prs. So. Au.**	7	25	4	35	16	43	7	39	21
9	M	**Ld. Mayor's d.** [bo. 1768	7	26	4	34	17	0	8	50	22
10	Tu		7	28	4	32	17	17	10	7	23
11	W	*St. Martin*	7	30	4	30	17	33	11	23	24
12	Th	Mor. of St. Mart. 2 Ret.	7	31	4	29	17	50	morn.		25
13	F	*Britius.* Venus sets 6 42 A	7	33	4	27	18	6	0	44	26
14	S		7	35	4	25	18	21	1	57	27
15	D	**22 S. aft. Trin.** *Machutu*	7	36	4	24	18	37	3	10	28
16	M		7	38	4	22	18	52	4	22	29
17	Tu	*Hugh B. Lincoln*	7	39	4	21	19	7	5	32	30
18	W	In 8 days of St. Mar. 3 Ret.	7	41	4	19	19	21	6	42	1
19	Th	Mars rises 2. 15 M	7	42	4	18	19	35	☽	sets	2
20	F	*Edm. K. and Mart.*	7	44	4	16	19	49	5 A	6	3
21	S	Fomalhaut So. 6. 56	7	45	4	15	20	2	5	41	4
22	D	**23 S. aft. Trin.** *Cecilia.*	7	46	4	14	20	15	6	24	5
23	M	*Clement*	7	48	4	12	20	27	7	19	6
24	Tu		7	49	4	11	20	40	8	19	7
25	W	**D. of Glo. bo. 1743** Cath	7	50	4	10	20	51	9	27	8
26	Th	[in 15d of S. Mart. 4 Ret.	7	51	4	9	21	3	10	38	9
27	F		7	53	4	7	21	14	11	52	10
28	S	**Michaelm. Term ends**	7	54	4	6	21	25	morn.		11
29	D	**Advent Sunday**	7	55	4	5	21	34	1	7	12
30	M	**St. Andrew**	7	56	4	4	21	45	2	23	13

Days.	D. of D.	Days of D.	D. breaks	Sun East.	Sun sets	Clock fast.	7 Stars So.
1	9 35	6 59	5 17	5 12	6 43	16 12	1 M 7
6	9 20	7 14	5 25	5 7	6 35	16 7	0 47
11	9 1	7 33	5 32	5 2	6 28	15 41	0 27
16	8 45	7 49	5 39	4 57	6 22	14 53	0 7
21	8 30	8 4	5 44	4 53	6 16	13 43	11 A 46
26	8 17	8 17	5 49	4 49	6 11	12 15	11 25

Full Moon 4 day 5 h. 29 m. morn.
Laſt Quarter 10 day 9 h. 48 m. night
New Moon 18 day 10 h. 4 m. night
Firſt Quarter 26 day 11 h. 9 m. night

S. ent. Capricorn
21d. 4h. 5m.
Apparent time.

1	Fu		7 57	4 3	21 54	3 M	43		14
2	W	Fomalhaut So. 6. 9	7 58	4 2	22 3	5	10		15
3	Th		7 59	4 1	22 11	☽	rises		16
4	F	Barbara. Moon eclipſed	8 0	4 0	22 19	4 A	24		17
5	S		8 1	3 59	22 27	5	15		18
6	D	2 S. in Advent *Nicholas*	8 2	3 58	22 34	6	21		19
7	M	Venus ſets 6. 33 A	8 2	3 58	22 41	7	39		20
8	Tu	*Conception Virgin Mary*	8 3	3 57	22 47	8	59		21
9	W		8 4	3 56	22 53	10	19		22
10	Th		8 4	3 56	22 59	11	37		23
11	F		8 5	3 55	23 4	morn.			24
12	S		8 6	3 54	23 8	0	52		25
13	D	3 S. in Advent *Lucy*	8 6	3 54	23 12	2	3		26
14	M	Mars riſes 1. 45 m	8 6	3 54	23 16	3	12		27
15	Tu	[Em. V.	8 7	3 53	23 19	4	23		28
16	W	O. Sap. Camb Ter. ends.	8 7	3 53	23 22	5	31		29
17	Th	Oxford Term ends	8 7	3 53	23 24	6	39		30
18	F	Sun eclipſed	8 7	3 53	23 26	☽	ſets		1
19	S		8 8	3 52	23 27	4 a	11		2
20	D	4 S. in Advent	8 8	3 52	23 28	5	2		3
21	M	St. Thomas. Shorteſt day	8 8	3 52	23 28	6	0		4
22	Tu		8 8	3 52	23 28	7	6		5
23	W		8 8	3 52	23 27	8	13		6
24	Th	Sun and clocks together	8 8	3 52	23 26	9	26		7
25	F	Chriſtmas Day	8 7	3 53	23 25	10	37		8
26	S	St. Stephen	8 7	3 53	23 23	11	51		9
27	D	1 S. after Chriſt. St John	8 7	3 53	23 20	morn.			10
28	M	Innocents	8 7	3 53	23 17	1	6		11
29	Tu	Fox Hunting comes in	8 6	3 54	23 14	2	26		12
30	W		8 6	3 54	23 10	3	49		13
31	Th	*Silveſter*	8 5	3 55	23 5	5	13		14

Days.	L. of D.	Day dec.	D. breaks	Sun Eaſt.	T w. ends	Cl. art S.	7 Stars ſo.
1	8 6	8 28	5 54	4 45	6 6	10 28	11 A 3
6	7 57	8 37	5 57	4 43	6 3	8 26	10 41
11	7 50	8 44	5 59	4 41	6 0	6 11	10 19
16	7 46	8 48	6 1	4 40	5 59	3 41	9 57
21	7 44	8 50	6 1	4 39	5 59	1 17	9 35
26	7 46	Incr. 2	6 1	4 40	5 59	1 be 13	9 13

ANSWERS *to the* QUERIES, REBUSSES, *&c. in Laſt Year's* DIARY.

Query I. *Anſwered by Mr.* Joſeph James, *of* Stoke-Biſhop, *near* Briſtol.

A Body will keep longer in moiſt ground than in dry, becauſe in the former caſe the air is more excluded than in the latter.

Query II. *Anſwered by* Caput Mortuum.

I believe, experience teaches that when children begin to make uſe of their hands, both are uſed indifferently, which perhaps would be the caſe when grown did they remain in a ſtate of Nature.—The preference given to the right-hand was certainly owing to *cuſtom*, for it does not ſeem to depend on the predominancy of any *natural* impulſe.

Query III. *Anſwered by Mr.* I. Dalby, (the Propoſer).

It has been a matter of diſpute among optical writers, whether an object when viewed through a magnifying lens appears farther off, or nearer, than when viewed with the naked eye; but the following experiments, I think, will clear up the point.

I. Bring a ſmall object nearer the eye than the limits of diſtinct viſion, then if a lens of a ſufficient magnifying power be properly placed between the eye and object it will be ſeen diſtinctly;—here it is evident that it *ſeems* farther off now viewed through the lens, for before we thought, and which was true in fact, that it was too near.

II. Take the tube of a common refracting teleſcope, or any other tube in one end of which is fixed a magnifying lens, through this look at the inſide of the tube and it will appear wider and longer according to the magnifying power of the lens: And the reaſon is this,—every object ſeen diſtinctly through the lens is magnified in length as well as breadth, and therefore a ſmall object placed in the tube muſt ſeem farther off than it would at the ſame diſtance if viewed with the naked eye, conſequently, in any caſe, if we conſider the ſpace between the glaſs and object as a tube, this experiment ſufficiently determines the matter in queſtion.

Hence, it follows, that the parts of an object when ſeen through a magnifying lens, cannot appear, with reſpect to each other, in their natural ſituation.

Query IV. *Anſwered by Mr.* Thomas Hatton.

When a body moves upon rollers the diameters of the rollers become as perpetual *radii* to the body moved, and the motion of the body is as thoſe *radii*; but the motion of the rollers is as their perpetual *radii*, therefore, as the former *radii* are double of the latter, the motion produced from them muſt be ſo too.

Query V. *in the Diary for* 1776. *Anſwered by Mr.* I. Dalby.

Perhaps it is impoſſible to determine who was the inventor of Pocket Watches, but it is certain they were in uſe before the time of *Hooke* or *Huygens*. We learn from *Twelfth-night*, Act 2. where Malvolio talks of winding up his watch, that they were worn in *Shakeſpeare*'s time; and we are told in *Stow*'s *Chronicle* that a watch was found upon

Guy

Guy Fawkes when detected in the powder-plot: this the Conſpirators bought the day before to determine how long the touchwood would burn before it kindled the gunpowder.—In the Engliſh *Orlando Furioſo*, *Fol.* 1591. there is a print of the tranſlator Sir *John Harrington*, with a watch before him on a table; near the hour of 12 a ring is fixed to the caſe, and another on the oppoſite ſide to which is tyed a ſtring with a key at the end, like that of a modern watch.

But before that time, if hiſtory can be credited, watch-work was brought to great perfection, for we are informed by *Lonicerus* in *Hondorfii Theatrum Hiſtoricum*, that the Emperor *Charles* V. had a watch of curious workmanſhip; this he once loſt in a croud, but it ſtriking the hour of the day in the thief's pocket alarmed him in ſuch a manner that he immediately confeſſed the theft:—probably this watch was made by *Jannellus Turrianus*, who uſed to divert the Emperor in his ſolitude with various mechanical devices, and, on account of his ingenuity, was called the *Archimedes* of his time.

Hooke ſeems to have been the firſt that regulated the ballance by means of a ſpring; tho' the invention was afterwards claimed by the *Abbé de Hautefueille*.

Since the above, we have received the following from Mr. Tho. Hatton, *Watch and Gold Scale-maker in the Old Baily, London.*

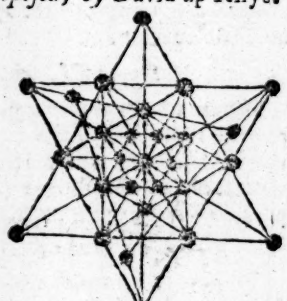
A few years ago there was found among the ruins of Bruce-Caſtle in Scotland a pocket watch, not of the largeſt ſize; on the dial, which is of ſilver, there are the words, *Robertus B. Rex Scottorum*, and on the upper plate where Watchmakers put their names, *Johann. Creitt. Mayr.* both engraven in the Old Engliſh letter; when it was found it had a piece of fine tranſparent horn inſtead of a glaſs. I have examined it in pieces and cannot find that it differs in the conſtruction from the watches made in *Huygens*'s time before the ſpring was applied to the ballance, having a fine catgut, a ſpiral ſpring, and two arms to the ballance, like thoſe old watches, many of which I have mended.

If the engraving is not an impoſition, it is certainly very old, as *Robert Bruce* died in 1328.—At preſent it is in the hands of an Antiquarian, and is look'd upon as a great curioſity.

Anſwer to the Paradox, with a new one propoſed, by David ap Rhys.

To the Propoſer.

In the margin's a plan, Sir,
Your purpoſe will anſwer.
Now ſhew, if you can, Sir,
(As you are a man, Sir,)
How in rows I can fix
Some twenty-four leeks;
But firſt, you muſt know,
I'd have four in each row,
On lines that are ſtreight,
And juſt twenty-eight.



Rebus I, *Anſwered by Miſs* Lackit, *addreſſed to the* Propoſer.

Sir, Are you a *youth* or a cunning *old ſtager*,
It matters not which, I'll my maidenhead wager,

That

That young *Lucy Lackit*'s as handſome and ſweet
As your faireſt of fairs, although ſhe's Miſs *Keet*.

All the Rebuſſes anſwered by Captain Flaſh.

Pox take all the whores, and the peace which is worſe, II.
I'm ruin'd in carcaſe as well as in purſe,
No *Bagnigg-wells* rake ever look'd half ſo thin, III.
Tho' exhauſted to nothing but bones and the ſkin;
At Almack's ſuch curſed ill-luck too I meet,
So, muſt ſtarve 'till the wars,—or elſe marry Miſs *Keet*. I.

ANSWERS *to the* ENIGMAS *in laſt Year's* DIARY.

I. A Flame	IV. A Windmill
II. Content	V. Parchment
III. A Fox	Prize. A Cloſe-ſtool.

The Prize Enigma anſwered by Miſs Lee.

The prize, if I gueſs right, is *cloſe-ſtool* or pot;
So I hope the ten Diaries will fall to my lot.

The ſame anſwered by Mr. Thomas Hoy.

Hodge, when by the fire, the Riddles read o'er,
Swore the prize could be nothing but ſome common-ſhore;
Says Nell, take a large doſe of jalap, you fool,
And I'll warrant 'twill put you in mind of *cloſe-ſtool*.

The ſame anſwered by Mr. Joſeph James.

When Limberham one night would clambet
Four ſtories up to Cloe's chamber,
Eager, and groping in the dark,
The aged, feeble, am'rous ſpark
O'er three-leg'd chair, O foul diſgrace!
Fell prone and broke the *ſacred vaſe*—
Said Cloe, you old fumbling fool,
Could not your worſhip ſmell *cloſe-ſtool*?

All the Enigmas anſwered by Mr. Leonard Walker.

Enigma the firſt I am ſure is a *flame*;
The ſecond, I think, we may *happineſs* name;
The third is a *fox*, ſans confuſion or doubt;
The fourth is a *windmill* moſt clearly made out;
The fifth muſt be *parchment* to bind knave and fool;
And Dalby's *ſweet* prize, a capacious *cloſe-ſtool*.

A general anſwer to the Rebuſſes and Enigmas by Mr. Dalby.

Says Dick to his wife, thou'rt the plague of my life,
I wiſh longer ſingle I'd tarry'd;
Or before I had led ſuch a ſcold to my bed,
That unto Miſs *Keet* I'd been marry'd. I. *Reb.*
Pox take ye, ſays Kate, when it was my fate II.
To be taken, for better, for worſe,
Tho' you were undeſerving, I kept you from ſtarving,
And with money repleniſh'd your purſe:

Hence I did not ſuſpect you'd your duty neglect,
But each night you lie ſtill,—ſnoring drunk,
Yet ſhew yourſelf ſtout at a *Bagnigge-wells* rout, III.
When regaling with ſome dirty punk.
Thus, you idle ſot, 'twixt a wh—e and the pot,
Divide all the caſh you can handle;---
Your tongue's very quick,---but no more, reply'd Dick,
Leſt your Tete meets the *flame* of this candle. I. *Enig.*
Quoth ſhe, who's *content* always to keep Lent?--- II.
But tho' you were cunning as *fox*, III.
It may be the fate of your *windmill*-like pate IV.
To look more like that of an ox.
I ſhall not be horn'd *gratis*, my dear *nunquam ſatis*,
Quoth Dick, for before I'm that fool,
This Calamus Rotang ſhall your *parchment* hide bang V.
'Till the floor you miſtake for *cloſe-ſtool*. *Prize.*

The TOBACCO-SMOKERS;

Being an Anſwer to all the Enigmas, *by Dr.* SLOP.

Companions, *Harry*, *Ned*, and *Will*,
One evening met to ſmoke their fill,
To laugh and tell a merry tale,
And bumpers quaff of nappy ale;
Harry, who uſed to ſmoke and drink,
Could do it eaſily as think,
And *Ned* at times would *burn the weed*
Either for company or need;
But *Will* had little uſed either,
And therefore maſter was of neither,
Yet now he was reſolv'd to try,
As we ſhall ſhew you by and by.
Pipes and tobacco ſoon were plac'd
Before 'em, and the table grac'd
With *candles*, matches,----all things fit, I.
And *ſtingo quantum ſufficit*,
Brew'd juſt three years ago come Lent,
Such any toper would *content*; II.
Harry and *Ned* their pipes ſoon fill'd
And rolling clouds of ſmoke diſtill'd,
Then, after each had took a pot,
Their pipes----and intellects grew hot,---
Related merry tales and jok'd
With as much ſpirit as they ſmok'd;----
Ned who was deem'd a ſportſman keen
Told how the *fox* ran o'er the green, III.
And when they thought him out of danger
Was catch'd on *Windmill*-Hill by Ranger, IV.
Where Tom and Joe the whippers-in
Swore they'd make *parchment* of his ſkin: V.

---Quoth

----Quoth *Harry*, now we have gone before ye,
Pray *Will* let's hear you tell a ſtory;----
But he had no great inclination
Or talents for confabulation,
Yet well their manner had perus'd,
And notic'd all the ſhifts they us'd,
A pauſe did every ſentence fit
To take a whiff and then to ſpit;
Thought he, it ſeems the true intention
Of ſmoking was to help invention,
Or introduc'd at firſt, perhaps,
Only to ſtop narration gaps,
And hold depending tale at bay
While thought dictates what's fit to ſay,
Be which it will it is well meant,
And now to ſmoke is my intent,----
Then pipes and 'bacco he fell hard on,
With "Gentlemen, I beg your pardon
"For this delay; but I'll begin
"As ſoon as e'er my pipe is *in*."----
Yet, when 'twas lighted he ſaid little,
For long intervals fill'd with ſpittle,
And draughts of ſmoke, and without doubt
Much more he ſwallow'd than let out,
This made him gape for breath much quicker
Than preaching Methodiſt----or vicar,
And almoſt choak'd with ſmoke and phlegm
Began to hiccup, cough and hem!
Quoth *Harry* (who obſerv'd the plight
Poor *Will* was in by's turning white,
For pipe and face were of a colour),
Z----ds *Will*, come fill thy pipe up fuller!
Or muſt I do it for thee,----ſhall I?
Why man thou art no friend to *Raleigh*;----
But *Harry* had no ſooner ſpoke
But was rewarded for his joke,----
Will long had ſtrove, with griping pain,
The doſe he'd taken to contain,
With which he now, oh, foul diſgrace!
Saluted *Harry* in the face,
At the ſame time, although no fool,
Miſtook his br---ches for *cloſe-ſtool*, *Prize.*
Then ſtaggering away to bed,
Curs'd *Raleigh*, *Harry*, pipes and *Ned*.

Ingenious Anſwers to the Queries, Rebuſſes, Enigmas, &c. have been received from Meſſ. John Clarke, William Fininly, Rogers, Joſeph James, Caput Mortuum, Miſs Greville, Miſs Lee, &c. but the prize of ten Diaries fell to the lot of Miſs Lee, who is deſired to ſend to Mr. Carnan's, N° 65, St. Paul's Church-yard, for them.----****Such of our Poetical Correſpondents as do not find their pieces inſerted, we hope will excuſe the omiſſion, as the Compiler unfortunately loſt the greateſt part of their Letters; but their future favours ſhall be particularly attended to.*

New QUERIES, REBUSSES, *&c. to be anſwered next Year.*

I. QUERY, *by* Cleonicus.

Why is the thick part of the leg called the *calf?*

II. QUERY, *by* Vulcan.

When a piece of iron is heated red hot and immediately cooled in water, it becomes *harder*, but if left to cool in the open air, *ſofter*: Can this be accounted for?

III. QUERY, *by* R. Burrow.

Cotton in his *Virgil Traveſtie*, *pag.* 9. has theſe lines,

Bounce, cries the port-hole, out they fly,
And make the world dance *Barnaby*.

Whence is derived the expreſſion uſed in the laſt line?

IV. QUERY, *by Mr.* Tho. Hatton, *Sen.*

Whether a practical geometer can execute the firſt problems of geometry *trueſt* with great or ſmall diſtances?

V. QUERY, *by Mr.* Dalby.

Whence proceeds the ſaltneſs of the ſea,---and is it more ſo *now* than *formerly?*

I. REBUS, *by Miſs* Lee.

The top of the *mode* and what never is old,
When join'd, a great genius's name will unfold.

II. REBUS, *by Mr.* Dalby.

A pronoun connected with half a high place,
Is a pit made for cabbage,---and folks void of grace.

III. REBUS, *by Miſs* Greville.

A word which ſaves ſome folks from being undone,
And one which means many and ſometimes but one,
When join'd, if you're with it, then you are alone.

IV. REBUS, *by* Beatrice.

Take half ſuch a number as cannot be few;
The end of an error; and part of a ſcrew;
What's always in priſon, yet never in fear;
What with malt, hops, and water make humming ſtrong beer;
Theſe joined, will tell you what ſome call an evil,
For each day 'tis a hundred times wiſh'd at the devil.

A PARADOXICAL REBUS, *by* Peter Wilkins.

One thouſand and one; twenty hundred, and fifty,
(You ſee of great numbers I would not be thrifty)
When properly joined, a poet ſublime
Will be form'd, tho' you'll own, no great dealer in rhyme.

An ACROSTIC REBUS, *by Mr.* Leonard Walker.

A godlike virtue found in ſacred writ;
A Grecian poet fam'd for ſenſe and wit;

A Britiſh

A Britiſh prelate who in exile dy'd;
A Roman prince to Livia near ally'd;
A place to which (if poets tell us true)
A fam'd muſician went his wife to view;
A valiant Greek in heavenly armour cas'd;
A falſe religion through the Eaſt embrac'd.
The initials join'd, a noble port will ſhew,
On which old ſeamen many thanks beſtow.

New ENIGMAS *to be anſwered in the next Year's* DIARY.

I. ENIGMA, *by Mr.* J. Keech.

I Am the ſtrangeſt thing in nature,
With neither form or make or feature,
A mere idea, and yet none,
And am no ſooner got than gone.
The Britiſh fair, who much me prize,
Never beheld me with their eyes,
(Such eyes as all the world pervade,
And turn to noon the darkeſt ſhade.)
Poſſeſs'd of me, the blooming train,
Attractive, charm the ſighing ſwain;
The melting look, the ſpeaking ſigh,
All doubly pleaſe when I am by:
But, if the nymph my uſeful aid
Regards not,---by her heart betray'd,
She's loſt for ever, and her name
Is handed down to public ſhame.
Now take me in another view,---
I'm oft hung up for public ſhew;---
And one hint more.---I'll deign to tell,
That clowns in *Berkſhire* know me well.

II. ENIGMA, *by Mr.* John Clarke *of Lincoln.*

Ere time began I do my being claim,
Before bright Sol appear'd I had a name,
And am the ſource of every living thing,
The great original from whence they ſpring,
Who, teeming forth out of my fruitful womb,
By a ſuperior being bade to come:
No ſooner was the powerful *fiat* given,
Than from my peaceful kingdom I was driven,
Matter, my deadly foe, uſurp'd my throne,
And ſpread its power to diſtant parts unknown,
Where ſwift-wing'd atoms lovingly embrace,
And join together in their deſtin'd place.
From me aroſe the tingy-finger'd morn,
When firſt Aurora did the hills adorn,
The golden ray, the chearing beam of light,
Whoſe power diſpels the ſable ſhades of night,

To journey round the airy globe began,
And kindly warm the chilly age of man.
My myſt'ries are too dark for vulgar eyes;
Within my heart the truth in private lies.
Sometimes, by ſtealth, when wit and ſenſe are fled,
I fill the vacuum within the head
Of one of our great *ſenatorial* band,
Who oft 'gainſt ſenſe and reaſon makes a ſtand;
Happy he thinks himſelf of me poſſeſs'd,
And fondly hugs the darling to his breaſt;
Whene'er he ſpeaks of me, the liſt'ning throng
" Dwell on the melting muſic of his tongue,
" The copious accents fall with eaſy art,
" Melting they fall and ſink into the heart;
" Wond'ring we hear, and fix'd in deep ſurprize,
" Our ears refuſe the cenſure of our eyes."
To me all vows and promiſes do tend,
And in my faithful boſom ever end.

III. ENIGMA, *by* Sligo.

From ages paſt I my exiſtence draw,
And keep the common robber ſtill in awe.
Sometimes I'm ſeen upon the humble ground,
Sometimes in higher regions I am found:
Plac'd by the cautious houſewife's careful hand
In midnight watch to take my ſilent ſtand.
There when the wily rambler roams abroad,
I bar his way and eaſe him of his load;
No more with vent'rous ſtep he e'er ſhall come,
No more return unto his former home,
But proſtrate laid, ſhall yield his lateſt breath,
And ſtruggling ſink into the arms of Death.
Grimalkin oft complains with out-ſtretch'd paw,
When ſlips the fav'ry morſel from her jaw;
And fain would make me feel her utmoſt ire
Or burn my body in conſuming fire.
No eyes---no legs---no arms---do I poſſeſs,
A mouth I have, but can't a word expreſs.
But one ſtrong tooth within that mouth is ſeen
And they can ne'er eſcape who come between.
'Tis ſaid by ancient poets in their Song
When tuneful harps have charm'd th' attentive throng,
That once I ſprung from forth a Cambrian's brain
Who oft had ſigh'd and wiſh'd for me in vain.
Secur'd their property and did protect
What locks and bolts and bars could not effect.
Since when I've been the theme of many a lay
Sung by briſk virgins on the jocund May:
Nay, even grave philoſophers have taught
The great advantages with which I'm fraught,

My

My uſe to every houſekeeper is known,
And few there are but claim me for their own;
Now I my merit and my worth proclaim:
Conſult, ye fair ones, and find out my name.

IV. Enigma, *by* Tycho.

An ancient knight (once fam'd for deeds of arms,
Whoſe actions fire us, and whoſe genius warms,
Once in a coward king's reproachful reign
Did fall a victim unto haughty Spain).
Brought me from foreign climes to Britiſh land,
Where now in eſtimation great, I ſtand.
All ranks of people my acquaintance court,
And to enjoy me eagerly reſort,
I favour contemplation's thoughtful brow,
And many a charm on ſolitude beſtow:
Nor leſs in feſtive throngs, for there I'm ſeen,
Where ſtill I ſit erect with jocund mien.
The juſtice grave, who takes his daily fee,
Retires from buſineſs to converſe with me.
The reverend prieſt----mattins and veſpers o'er,
With me relaxes care, and owns my power.
In Belgia's clime, my company is known,
And every *Mynheer* claims me for his own;
When the droll jeſter makes the table roar,
And *Yorick*'s thoughts on eagles' pinions ſoar;
In circling clouds I round the temples twine,
I chear the drooping heart, and thoughts refine.
Vaſt funds of treaſure into England come,
Which ne'er had been had I remain'd at home.
With wealth I many families ſupply,
Who for ſubſiſtence do on me rely.
But ſince contending ſtorms began to roar,
And *feuds unnatural* ſhook th' *Atlantic ſhore*;
That wealth decays, *Britannia*'s ſons do mourn
Their *traffick loſt*----but ſoon may it return.
Heaven grant this pray'r may not be made in vain,
And Peace and Plenty bleſs great George's reign.

V. Enigma, *by Mr.* Clarke.

In Heaven's wide expanſe I had my birth,
Sent down by God, to cheer the mourning earth.
My properties are of Celeſtial kind
His bounty gave, to bleſs the human kind.
If grief or wrong, their ſcorpion ſtings entwine
I bear with patience nor do e'er repine:
I never vaunt of benefit conferr'd,
Or puff'd with pride, ſpeak an abuſive word.
Nor yet in works of wickedneſs rejoice,
But in the praiſe of Truth exalt my voice.

All ills with reſignation pure I bear,
And Faith ſupports me in my greateſt care.
On Hope's ſheet anchor firmly I rely,
Nor Envy's tooth can e'er my bliſs annoy.
They who confide in me can never fail
But ſafely paſs thro' life's uncertain vale;
Happy the man poſſeſs'd of me remains,
No Sorrow hurts him, nor the greateſt pains
Can ſhake the ſettled temper of his ſoul,
Or draw his thoughts from the Celeſtial goal.
But let me add and to the truth attend;
No ſelfiſh mortal can I e'er befriend.
If pride or ſpite ſhould ruſh upon the thought,
Then my aſſiſtance vainly will be ſought.
The good, the honeſt and religious man,
Whoſe upright mind does every virtue ſcan,
Whoſe boſom's not with direful rage poſſeſs'd,
But ſweet forgiveneſs dwells within his breaſt,
Who ſeeks with haſte the anxious wretch to cheer,
And wipes from Sorrow's eyes the falling tear,
He!---he! alone the rapturous knowledge bears,
And in his ſoul my heavenly form he wears,
That when releas'd from theſe his earthly chains,
I'll waft him up to the eternal plains.

VI. Enigma, *by Mr.* J. Bonnycaſtle.

Ladies, I'm a human creature,
Fleſh and blood as well as you,
But ſo myſterious is my nature,
I am known to very few.

Juſt as whim and chance direct
I or male or female prove,
Now French politeneſs much affect,
And *now* a haughty Spaniard move.

Sometimes in ſtarch opinions dreſt
Of gravity and deep conceit,
Anon my humour is expreſs'd
By quarrelling with all I meet.

But, tho' I am the oddeſt wight
That ever mortal eyes did ſee,
Ye lovely fair! your ſole delight
Conſiſts alone in loving me.

Not Strephon ſighing at your feet
And breathing vows of amorous pain,
Can half the favours hope to meet
Which I from you ſo often gain.

You too, ye beaux, my charms confeſs,
Eſteem my worth, and prize me more
Than miſers, when their hoards they bleſs,
Eſteem and prize the golden ore.

Should

Should you your chance in Fortune's wheel
Purſue, and gain the lucky fee;
However happy you might feel,
Yet ſtill mankind would wiſh 'twere me.

If from theſe hints you find me out,
'Twill pay your trouble ten times o'er,
But after all your ſearch, I doubt,
You'll be no wiſer than before.

VII. ENIGMA, *by Mr.* J. Dalby.

Feſtina lente, Sirs,——behold!
A hero impudent and bold,
Who dares demand the precedence
Of ladies, lords,---or men of ſenſe;
Should you diſpute this, upon trial
You'll ſeldom find I brook denial;
---Yet am, although ſuch great command,
Obſequious to each turn of hand.
There's no court-ſpy, with all his arts,
Has my inſinuating parts,
Yet at the tables of the great,
And all the cabinets of ſtate,
Know, I myſteriouſly attend,
But their undoing is my end.
When pride has kindled war's alarms,
And drums and trumpets ſound to arms,
Where roaring gun's deſtructive balls
With dreadful ſhock ſalute the walls
Of ſome ſtrong fort,---if taken, I
Am ſure to crown the victory.
Now weary Sol withdraws his light,
And half the world is hid in night,
Ere in the boxes watchmen ſleep,
Or city nymphs their vigils keep,
On ſome dark gloomy hole I fix
To ſhew circumlocutive tricks;
Juſt at the front there ready ſtands
A caſtle rais'd by ſkilful hands,
With various windings, intricate
As *maze*, or *labyrinth of Crete*,---
Here a ſtout chieftain takes his place,
Who only dares to ſhew his face,
But then, his fortitude is ſuch
When charmed with my magic touch,
With horrid clang darts from the bounds,
While through the dome the noiſe reſounds;
---Strange, although true!---out came this elf
For ſafety, and to hide himſelf.
Search all the *pharmaceutic* pack,
From *Dr. Potts* to *Moorfields Quack*,

No noſtrum's found, wherein combine
The virtues that can equal mine,
Who am, you'll own, the leaſt inertive,
The moſt aſtringent, and apertive:
---Such phyſic may preſerve your life,
But ſeldom can a wanton wife,
In vain, the cure on me depends,---
I'm counterfeited for her ends.
So Danae fair was thought ſecur'd
When within brazen walls immur'd,
But am'rous Jove with golden charms
Broke through, and ſunk into her arms.

VIII. ENIGMA, *by* Cleonicus.

Ye riddl'ing wits, to me attend,
And liſten to a common friend,
For each of you my aid require,
I turn the verſe, and ſtring the lyre.
Among you oft well pleas'd I'm ſeen
If no ill nature ſteps between,
But if there ſhould, I quick retire,
And take the wit, and leave the fire;---
For there's a ſet of ſober fellows
Of whom, in truth, I'm always jealous,
And if I meet with them,---'tis true,
I'm ſometimes beaten black and blue.
And now my pedigree to trace:---
I'm near as old as human race,
For the firſt bride, with *Nic's* aſſiſtance,
Brought *guilt* and me into exiſtence,
And paſs'd me off to her *good-man*,
As ſince her *pretty* daughters can.
With male and female now I'm found,
This laughing, jeſting world around,
Who play me off on one another,
On wife, on huſband, father, mother,
And ſo about from one to t'other.
By me, 'twas Jacob gain'd the bleſſing,
And all the land for his poſſeſſing;
And Judith, by my aid and tricks,
Sent Holofernes 'croſs the ſtyx.
Uriah found me to his coſt,
To be in battle the firſt poſt,
Where plac'd by me, he loſt his life,
That David might poſſeſs his wife.
Much more I could of ancient lore;
But I have ſaid enough before:
And now to come to modern days,
Where I at balls, park, cards and plays,
In far more ſhapes attract your view
Than changeful *Proteus* ever knew;

Therefore to trace them were in vain
At *Enfield-Waſh*, or in *Cock-Lane*,
Or in the *unknown Southern main*.

I have a ſiſter, lovely creature!
Who's very like me in her nature,
Who with her poignant wit beguiles
The tedious hours, and wins your ſmiles;
She is in various colours ſeen,
But not in either blue or green;
Take one hint more,---if hints you lack,
By all men ſhe's ador'd---when black.

If you a courtier's levee grace,
In hopes to gain a friend or place,
You'll find,---the ſages all agree,
Friend, place or penſion end in me.

Tho' I am not to place confin'd,
But range among all human kind,
One of my houſes may be found
In *Covent-Garden* th' whole year round:
And if you'd know where elſe I be,
I'm always on the *Change* at *three*.

IX. ENIGMA, *by* Calliope.

Far from the buſy world's tumultuous noiſe,
Where anxious care each genial bliſs deſtroys;
Far from the court where adulation reigns,
I ſeek the peaceful refuge of the plains;
No vaulted roofs conceal my humble head;
By patience nurtur'd, and by virtue fed:
The ſimple cottager has known me long
The ſubject of his morn and evening ſong;
With jocund reed, he tunes his ruſtic lays,
And echoes me the theme of all his praiſe;
Fair white-rob'd innocence attends me ſtill,
And ſmiling peace, ſecure from every ill.
Long ere the virgin's ſnowy breaſt began
To heave and throb, when firſt ſhe wiſh'd for man,
Before fly Cupid made her own his ſway,
(Whoſe ſovereign power both men and gods obey)
Whether in lonely ſhades ſhe mus'd along,
Or, in the feſtive dance, or choral ſong,
Nimbly ſhe tript around about her bed,
Night drew its ſable curtains o'er her head,
Upon her ſteps I ever did attend,
Her ſole companion, and her deareſt friend.

I ſoften labour, make the wretched ſmile,
And chear the drooping mourner's heavy toil;
And in the gloomy priſon oft am ſeen
Sitting on ſorrow's brow with heavenly mien;
The abject ſlave, who drags his galling chain
Beneath the line in *Afric*'s ſultry plain,

Deign

Deign I, my kindly influence he ſhould ſhare,
Huſh'd all his griefs, and baniſh'd all his care,
With fortitude the cumb'rous load he bears,
And all his mind for future joy prepares;
His ſoul expands with pleaſure yet unknown,
And his hard couch becomes a bed of down.
Judge ye, who can, my name,---from whence I come,
And be your boſom ſtill my conſtant home.

X. ENIGMA, *by Mr.* J. Bonnycaſtle.

When firſt my origin began,
Whether before the race of man,
Or, if I Adam did ſucceed,
Philoſophers are not agreed:
But know, ye bards, that I can trace
From earlieſt times my noble race,
And ſhew that emperors and kings,
(From whom both life and honour ſprings)
Are my progenitors and ſires,
Hiſtorians elſe are arrant liars.
Moſes, the Jewiſh legiſlator,
Than whom, 'tis ſaid, no man was greater,
When he deſcribes the world's creation,
You'll find me in the ſtrange relation;
And when the ſeers did prophecy,
Who in their mouths ſo much as I?
King Solomon, that ſapient prince,
And all his brethren ever ſince,
Have us'd me as a common ſlave
On all occaſions, gay or grave;
T'harangue the court, or pleaſe the rabble,
And found no one ſo ſerviceable.
Philoſophers of ancient date,
Held in the world's opinion great,
Too numerous for me to name,
To my aſſiſtance owe their fame;
And modern ſages, all agree,
Are quite as much oblig'd to me.
See but in theſe enlighten'd days
Religion ſplit a thouſand ways,
Each ſect for modes of faith contending
On which Salvation is depending,
And who to diſbelieve's inclin'd
To hell and Satan is conſign'd;
In each debate I ſtill preſide,
And all their arguments provide;
Still furniſh matter for diſpute,
"Confute, change hands, and ſtill confute."
As o'er a mug of filthy ale
Sage Philo' tells his baudry tale,
Or deep in mathematic lore,
Recounts his various problems o'er,

The wond'ring audience gaping wide,
Throw both their pipes and ale aſide,
And half aſtoniſh'd, all agree,
Sage Philo' is inſpir'd by me.
To me the learn'd muſt ever yield,
And logic quit the well-won field,
What I aſſert you can't deny,
Nor for my wherefore bring a why,
My arguments admit of no reply.
In ſhort, my powerful aid is ſuch,
I never can be priz'd too much;
And thoſe who pleaſe to condeſcend
To uſe me as their boſom friend,
May ſafely truſt to my alliance,
And bid to all the world defiance.

PRIZE ENIGMA *(of* 10 *Diaries) by Mr.* Leonard Walker.

Liſt, ye fair, a maſquerader
Comes his artleſs tale to tell;
Deem him not a rude invader,
Who can charm the faireſt belle.

From the days of grandſire Adam
Down to this auſpicious time,
I've delighted ev'ry madam
Who enjoy'd her youthful prime.

Ruſtic ſwains, when they are wooing,
Often claim my potent aid;
I, in all their am'rous cooing,
Always pleaſe the love-ſick maid.

As the beſt of earth-born creatures
Sometimes widely go aſtray,
So I've been, by artful features,
Sometimes tempted to betray.

By my zeal to pleaſe a fair one,
I old Satan's envy rais'd;
Can this inſtance be a rare one,
Which the epic bard has prais'd?

No fair nymph did e'er enfold me,
Circl'd in her lilly arms;
Nor did ever nymph behold me,
Whilſt I feaſted on her charms.

Sweet, O ſweet! the thrilling pleaſure,
Which to youth I ſtill impart;
Not the miſer's darling treaſure
Charms ſo much his anxious heart.

Now, fair maids, I've told my ſtory;
So I humbly bid adieu:
May you ſtill attain freſh glory,
And your ſwains prove kind and true!

Anſwers

Anſwers to the Mathematical Queſtions *propoſed in laſt Year's* DIARY.

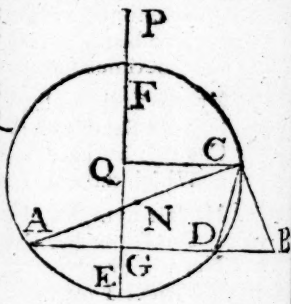
I. QUESTION, *anſwered by Mr.* Tho. Hatton.

BY diviſion the equations become $x^2+y^2=\frac{a}{xy}$, and $x^4+y^4=\frac{b}{xy}$, ſquare the firſt and we ſhall have $x^4+y^4=\frac{a^2}{xy}-2xy=\frac{b}{xy}$, hence $2xy=a^2-b\frac{1}{4}$ $(=n)$ therefore by ſubſtitution we ſhall get $x^2+2xy+y^2=\frac{2a^2}{n}+n$, and $x^2-2xy+y^2=\frac{2a}{n}-n$, and extracting the ſquare root, $x+y=\frac{2a^2}{n}+n\frac{1}{2}$, and $x-y=\frac{2a^2}{n}-n\frac{1}{2}$ $\therefore x=\frac{1}{2}\sqrt{\frac{2a^2}{n}+n}+\frac{1}{2}\sqrt{\frac{2a^2}{n}-n}$, and $y=\frac{1}{2}\sqrt{\frac{2a^2}{n}+n}-\frac{1}{2}\sqrt{\frac{2a^2}{n}-n}$.

In this manner nearly the ſolution was given by Mr. Joſeph James, *of* Stoke Biſhop, *near* Briſtol, *and Mr.* Benj. Hayſon. *Anſwers were alſo received from Meſſrs.* Barker, Simmons, Rowley, Moody, Smith, *and the propoſer.*

II. QUESTION, *anſwered by Mr.* Jer. Ainſworth.

Conſtruction. Upon A D the given diff. of the ſegments of the baſe deſcribe a ſegment of a circ. A F D to contain the diff. of the angles at the baſe, draw the diameter E F ⊥ A D. let F E be to G P in the given ratio, and make G Q × G P = the given rectang. Alſo draw Q C = A E, and take C B = C D, and A B C is the triangle required.——For let C B be to C N in the given ratio; then G Q × F E = C B × C A (*Simp.* Geom. 25 3.): G Q × G P :: F E . G P (that is, by conſtruc.) :: C B : C N :: C B × C A : C N : C A; conſequently C N × C A = G Q × G P. Alſo the ang. A B C (C D B) − C A B = A C D. Q. E. D.



Meſſrs. Keech, Sanderſon, &c. obſerve that the rectang. of the ſides is given, and thence give very ſimple conſtructions.—*It was alſo anſwered by the propoſer, and Mr.* Tho. Barker.

III. QUESTION, *anſwered by Mr.* Will. Hedley.

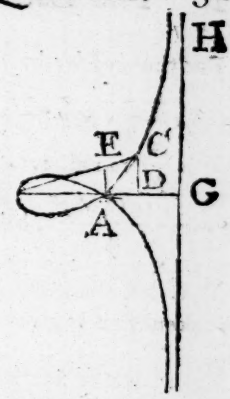
In the annexed figure, let A B = a, A D = x, D C = y, and by the given property of the curve make A E : E C :: m : n; then by ſim. triangles,

$+x : y :: a : \frac{ay}{a+x} = AE$, and $\sqrt{x^2+y-}$

$\overline{\frac{ay}{+x}}^2 = \frac{x}{a+x}\sqrt{y^2+\overline{a+x}^2} = EC$; whence

$\frac{ay}{+x} : \frac{x}{a+x}\sqrt{y^2+\overline{a+x}^2} :: m : n$, hence

we get $y = \frac{m \times \sqrt{ax+x^2}}{\sqrt{n^2-a^2-m^2x^2}}$, for the Equation of the required curve.



The flux. of the Area $y\dot{x} = \frac{ax\dot{x}+a^2\dot{x}}{\sqrt{\frac{n^2a^2}{m^2}-x^2}} = \frac{ax\dot{x}}{\sqrt{b^2-x^2}} + \frac{x^2x}{\sqrt{b^2-x^2}}$,

$\left(\text{putting } b^2 = \frac{n^2a^2}{m^2}\right)$ the fluent of which properly corrected is $ab +$

rea of quad. whoſe rad. is $b, = \frac{n}{m}a^2 + \frac{7854\,n^2a^2}{m^2}$ for the area of he whole curve ſpace A C H G.

Corol. when $x = \frac{na}{m}$, y is infinite; and conſequently G H is an aſymptote to the curve:—if $n=m$ the point A will be a *nodus*, or double point of the curve as per Fig.—if n be greater than m, y will be nothing when $x=a$, that is the curve will paſs through B,—if n be ſs than m, then x can never become $=a$, &c. &c.

The ſame anſwered by Mr. Jer. Ainſworth.

Let fall the perp. C P and take A Q to A B in the given ratio of C to E A. then by permutation; A Q : E C :: A B : E A (that is fim. triang.) :: B P : P C. And by reaſon the ||s E A, P C, E C : A P :: B C : B P, herefore *ex æquali* A Q : A P :: B C : P C, A Q² : A P² :: B C² (B P² + P C²) : P C², d by diviſion A Q² — A P² : A P² :: B P² : P C², e nature of the curve required.

Or, making A B = a; A Q = p, A P = x, d P C = y, $p^2-x^2 : x^2 :: a \circ x^2 : y^2 = \frac{x \times a \circ x^2}{p^2-x^2}$, and $y = \frac{ax \circ x^2}{(p^2-x^2)^{\frac{1}{2}}}$. Hence it idently follows that if Q S be drawn ⊥ to Q it will be the aſſymptote of the curve. nd moreover if E C be greater than E A the rve will paſs through the point B.

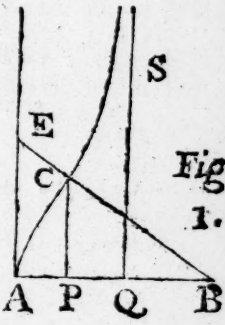


Fig. 1.

For

For the area we have $y\dot{x} = \frac{a x \dot{x} \div x^2 \dot{x}}{p^2 - x^2)^{\frac{1}{2}}}$, and the correct fluent is $ap - \overline{a - \frac{1}{2}x} \times \overline{p^2 - x^2)^{\frac{1}{2}}} - \frac{1}{2}p^2 \times$ arc whoſe ſine is $\frac{x}{p}$ to rad. 1. and when $x = p$, becomes $ap - \frac{3,1416 \times p^2}{4}$, being the area of the whole ſpace between the curve and aſſymptote when E C is leſs than E A, as in *Fig.* 1. Or if x be taken $= a$ it gives $ap - \frac{1}{2}a\sqrt{p^2 - a^2} - \frac{1}{2}p^2 \times$ arc whoſe ſine is $\frac{a}{p}$ to rad. 1. being the area of the ſpace A R B in *Fig.* 2. where E C is greater than E A: In which caſe the area of the whole curve included between B Q and the aſſymptote will be found (by correcting the fluent ſo as to vaniſh when $x = a$, and afterwards making $x = p$) to be $= \frac{3,1416 \times p^2}{4} - \frac{1}{2}p^2 \times$ arc whoſe ſine is $\frac{a}{p} - \frac{1}{2}a\sqrt{p^2 - a^2}$.

Fig. 2.

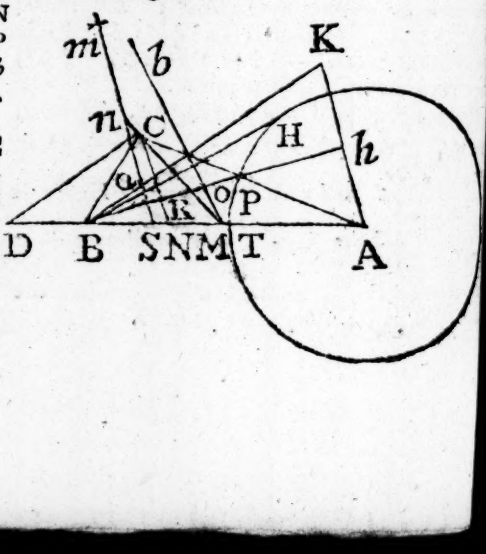
The equation of the curve being put into fluxions and made $= o$, gives $x^3 - 2p^2x + ap^2 = o$, from whence the value of x, at the higheſt part of th ecurve A R B will eaſily be found.

The ſolution given by Mr. Todd *is not materially different from the above; it was alſo anſwered by Mr.* Tho. Barker, *Mr.* Simon Woolcott, *and the propoſer.*

IV. Question, *anſwered by* Caput Mortuum.

Conſtruc. Make the $\sphericalangle$ K B A = the given $\sphericalangle$, and take B K = B A, and join A K; then with the given diff. of B C and A C, as a radius, deſcribe a circ. about the center A, biſect T B in S and draw S Q || A K, produced at pleaſure, in which find the cent. m of a circ. which ſhall paſs through B and touch the circ. A, biſect S m in n, and B A in M, join M n, and find the cent. C of another circ. which ſhall paſs through B and touch the circ. A, then draw A C, C B, and C D || B K, and the thing is done.

Demonſt. Draw C N || m S, and through P draw B b, alſo let M b be drawn $\perp$ to the tang. B H.



By conſtruc. the $\sphericalangle$ C D B = K B A the given $\sphericalangle$, and A C − C B = A P the given diff. and becauſe of the || s C N, K A, and K B, C D, the $\triangle$ s D C N, B K A, are ſim. and ſo

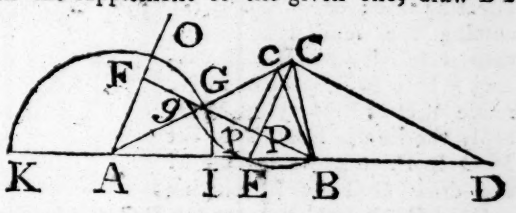
D N = D C. ∴ A D − C D (D N) = N A. Now the Locus of the centers (S, C, *m*, &c.) of an infinite number of circles paſſing through the point B and touching the circ. A, is an hyperbola whoſe cent. is M, vertex S, and aſſymptote M *b*; and ſince C N || *m* S, and M C *n* biſects S *m*, it follows that C N is a tang. to the hyperb. in the point C; conſequently a line drawn from any other point of the hyperb. || *m* S will meet A B on that ſide of N next B, ∴ N A = A D − D C, is a *minimum*.

Becauſe Q S, is ⊥ to a line biſecting the ∢ K B A, and C N || Q S, C R and Q S are ⊥ B P. ∴ B P biſects the ∢ K D A; — hence the conſtruc. becomes much more ſimple, thus, — having drawn B *b* to biſect the ∢ K B A, through P draw A C ſo that P C = C B, and C is the vertex of the △.

Here it is to be obſerved that A P muſt always be leſs than A B; but greater than A *b*; or which is the ſame thing, the ∢ B O M made by the aſſymptote and B *b* muſt always be greater than a right one, otherwiſe a tang. cannot be drawn to the hyperb. ⊥ B *b*, and in that caſe the point N will fall in A, and the *min.* becomes = *o*; — hence it follows that A D muſt always be greater than A C. If inſtead of a *min.* A D − A C was to be a given quant. as A S, draw S *m* || A K, then find the center *m*, as before, and it will be the vertex of the △.

The ſame anſwered by Mr. George Sanderſon.

Conſtruc. About A as a center, and with the given difference of the ſides as radius deſcribe the ſemicircle I G K, draw A O making the ∢ B A O equal to half the ſupplement of the given one, draw B F ⊥ A O cutting the ſemicirc. in G, biſect G B in P, and through G draw A C to meet P C drawn || to A O in C; join C B, and draw C D meeting (A B produced) in the given angle in D, produce C P to meet A B in E; and A E is the *min.* required.



Demonſt. Since C E is || O A the ∢ D E C = D A O = to half the ſupplement of C D E the given ∢ by conſtruction, the angles D E C, D C E are equal and C D = D E, alſo A D − C D = A E; now as G B is biſected by the ⊥ P C, and the points A, G, C in a right line, a circle with C G radius touches the ſemicircle and will paſs through B (Simp. Geom. b. iii. prob. 2 and 7) therefore A C − C G = A G (= A I) the given difference; but becauſe the triangles E B P, A B F are ſim. and all the angles conſtant, and the triangle G C B iſoſceles, and the ∢ B G C in the circumf. of the ſemicirc. I G K, the vertex C (or the center of a circle whoſe circumf. touches the ſemicircle) muſt always be found in a line || to A O, therefore when their diſtance F P is a minimum, A E muſt be a minimum; take F *p* leſs than F P, and make *p c* || A O, with B *c* radius deſcribe the arc of a circle to cut B F (produced if neceſſary) in *g*, then *p g* = B *p* (Simp. Geom. b. iii. p. 2.) = G P + P *p*, whence it is manifeſt the

circle with B *c* radius cuts or includes the ſemicircle I G K, therefore no circle can be found whoſe center is in a line ‖ to A O, and diſt. leſs than F P to touch the ſemicircle I G K, therefore A E is a minimum.

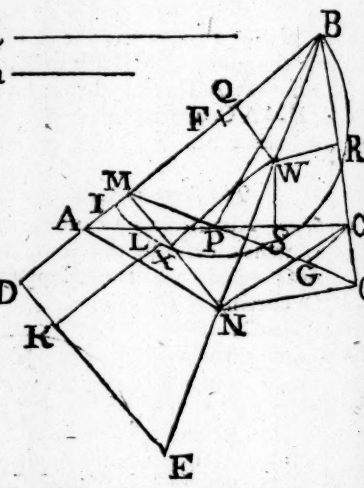
When the ∠ B A O is ſuch that B F neither cuts nor touches the ſemicircle, C D may be conſtructed equal to A D, or their diff. A E will be nothing.---In the other part of the data where C D is to be greater than A D it muſt be for a given quantity, as their diff. will be nothing when a minimum.

Mr. Jer. Ainſworth *conſtructed this prob.*

V. Question, *anſwered by Mr.* Joſeph Keech.

This queſtion may be reduced to that of having the perimeter, the vertical angle, and the line biſecting the baſe, of a triangle, given.

Conſt. Make B D = ½ the perimeter, make the angle D B C = *z* given angle, which biſect with the line B E meeting a perpendicular from D in E, take B F a third proport. to B D and D E, and with F center and F B radius deſcribe a ſemicircle B L I, take D K = to the ſide of a ſquare which is the difference of the ſquares of D E and *l*, the biſecting line; draw K L ‖ B D cutting the ſemicircle in L, thro' L ‖ D E draw M L N cutting B D in M, and B E in N, make B Q = B M, join M O, apply the line *l*, from B to cut M O in P, take P G = P M and draw G C ‖ B M cutting B O in C, draw C P A, and A B C will be the triangle required.

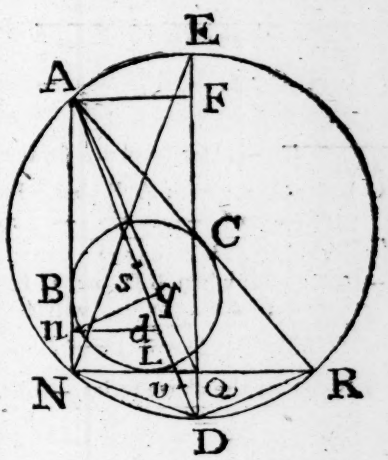


Dem. Draw N A, N C, N O, and take N W = N A, and let fall the ⊥s W Q, W R, W S from W on the ſides of the triangle, draw W X ‖ B M cutting M N in X, and let *m* × B D = A S C; it is evident by conſt. that A B C = vertical angle, B P = *l*, and that A C is biſected in P; but ſince the angles B C N and B A N are equal to 180°. a circle will paſs thro' the points A, B, C, N and therefore by Simſon's Trig. prob. 11, and oracle queſt. 67, B M = ½ the ſum of the ſides, A M (= C O = P S) = half their difference, and W the center of the inſcribed circle and ∴ W X = A P = Q M ∴ B Q = exceſs of the baſe above half the perimeter of the Δ A B C; but by Simſon's Geo. 11. III: B M² − B P² = A P² − A M² = A S C (by 9. II of ſame) and by conſt. B M² − B P² = 2 B M − D B × B F, and 2 B M − D B = B Q (if B D = ½ perimeter of the Δ A B C) ∴ by equality F B Q = A S C = B D × *m* ∴ F B : B D :: *m* : B Q and D E² (= D B F) : B D² :: A S C (= B D × *m*) : D B Q which is prop. v. Simſon's Trig. and therefore B D = half the perimeter of the Δ A B C.

The

The ſame anſwered by Mr. Jer. Ainſworth.

Analyſis. Imagine the triangle A N R to be circumſcribed by the circle N A E R whoſe diam. D Q E is ⊥ to N R. Let fall the ⊥ A F, and draw E N, N D, D R and A D; alſo, from q, the center of the circle to which A C and A B are tangents, raiſe $q\,n$ ⊥ to A q, and $n\,d$ to A n, and make $q\,s = q\,d$.---Then ſince AD^2 (= DF × DE) : DF × 2 DQ :: DE : 2 DQ, by converſion $AD^2 : AD^2 - 2DF \times DQ : DE : DE - 2DQ$; but it is well known that $q\,D = N\,D$, and by Euc. 4. 2. that $Aq^2 + qD^2 + 2\,A\,q \times qD = AD^2$, therefore $A\,q^2 + N\,D^2 + 2\,A\,q \times N\,D : AD^2 - 2\,DF \times DQ :: DE : DE - 2DQ$, that is by ſim. figures :: $A\,d : A\,d - 2\,d\,q = A\,s$. And $A\,d \times \overline{AD^2 - 2\,DF \times DQ} = As \times \overline{Aq^2 + ND^2 + 2\,A\,q \times ND}$, but $N\,D^2$ (DE × DQ) : DQ^2 :: DE : DQ that is :: $A\,d : d\,q$, or $A\,d \times \overline{DQ^2} = d\,q \times \overline{ND^2}$, which being added to what was before found gives $A\,d \times \overline{AD^2 - 2\,DF \times DQ + DQ^2}$, or by Euc. 13. 2. $A\,d \times AQ^2 = As \times \overline{Aq^2 + 2\,A\,q \times ND} + A\,q \times ND^2$, wherefore $\frac{Ad}{Aq} \times AQ^2 - As \times Aq = ND^2 + 2\,As \times ND$;---hence this



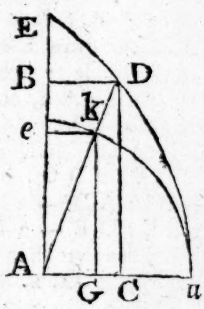
Conſtruction. Conſtitute the rectangle under A v and A q equal to $\frac{Ad}{Aq} \times AQ^2 - s\,Aq$, and take q D, D N each equal to the leſs of two reciprocals to A v, A q, and which differ by 2 A s, and from N draw the tangent N Q R which will be that required.

Limitation. If A D croſs the circle in L, A Q muſt not be leſs than A L.

We have been favoured with a more elegant ſolution to this queſtion from the ſame; and we are very ſorry it came too late to be inſerted in the room of the above.

A different conſtruc. was alſo given by the propoſer, which were all the anſwers we received to this difficult prob.

VI. QUESTION, *answered by Mr.* Tho. Todd.



If $p = 3.14159265$, &c. $z = BA = \text{arc } k\,u$ by the quadratrix; $y = BD = AC$; and $r = A\,u = 20$ inches half the bung diameter; then by the circle, $k\,G = e\,A = \frac{z - \frac{z^3}{6r^2} + \frac{z^5}{120r^4} - \frac{z^7}{5040r^6}}{}$ + &c. $e\,k = AG = r - \frac{z^2}{2r} + \frac{z^4}{24r^3} - \frac{z^6}{720r^5} + \frac{z^8}{40920r^7}$ —, &c. and by similar triangles $G\,k = e\,A : e\,k :: A\,B\,(z) : B\,D = y = r - \frac{z^2}{3r} - \frac{z^4}{45r^3} - \frac{2z^6}{945r^5} - \frac{z^8}{4725r^7} - \frac{22z^{10}}{93555r^9} - \frac{1382z^{12}}{638512875r^{11}}$ — &c.; and when B D, or y, becomes the semi-head diameter = 15 inches; A B, or z, will be half the length of the cask $= r\sqrt{.713570176252}$, &c. $= r \times .8447308 = 16.894617$ inches found by reverting the above series.—Therefore $\dot{S} = p \times \overline{BD}^2 \times \dot{BA} = p\dot{z} \times \overline{r - \frac{z^2}{3r} - \frac{z^4}{45r^3} - \frac{2z^6}{945r^6} - \text{&c.}}^2 = p\dot{z} \times r^2 - \frac{2z^2}{3} + \frac{z^4}{15r^2} + \frac{22z^6}{189r^4} + \frac{z^8}{675r^6} + \frac{22z^{10}}{10395r^8} +$ &c. the fluxion of the solid generated by the revolution of the space A B D U about B A, whose fluent $S = p \times r^2 z - \frac{2z^3}{9} + \frac{z^5}{75r^2} + \frac{2z^7}{1323r^4} + \frac{z^9}{6075r^6} + \frac{2z^{11}}{114345r^8}$ + &c. the solid itself; which, when $z = r\sqrt{.713570176252}$ gives $S = 21230.40058 \times 1 - \frac{2}{9} \times .71357017 + \frac{1}{75} \times \overline{.71357017}^2 + \frac{2}{1323} \times \overline{.71357017}^3 + \frac{1}{6075} \times \overline{.71357017}^4 + \frac{2}{114345} \times \overline{.71357017}^5 +$ &c. $= 21230.40058 \times .84881312 = 18020.64255$, &c. cubic-inches: Twice which, is 36041.285 ditto $= 127.809$ ale gallons, the contents of the cask required. Hence we may also find the area A.

For $\dot{A} = BD \times \dot{z} = r\dot{z} - \frac{z^2\dot{z}}{3r} - \frac{z^4\dot{z}}{45r^3} - \frac{2z^6\dot{z}}{945r^5} - \frac{z^8\dot{z}}{4725r^7} - \frac{2z^{10}\dot{z}}{93555r^9}$ — &c. $\therefore A = rz - \frac{z^3}{9r} - \frac{z^5}{225r^3} - \frac{2z^7}{6615r^5} - \frac{z^9}{42525r^7} - \frac{2z^{11}}{1029105r^9}$ — &c. = area of A B D U, the same (all but the last two terms) as given by Dr. Wallis in his Algebra, p. 344.

The proposer, *Mr. William Wilkin*, intended to have given a solu-

tion,

tion, but death untimely prevented him; we mention with the utmoſt concern the loſs of this very ingenious young gentleman, who, to a moſt engaging and amiable diſpoſition, united thoſe talents which bid fair to have rendered him one of the greateſt mathematicians of the age. He died on Jan. 15, 1777, in the 24th year of his age.

VII. Question, *anſwered by* Aumuneim.

The ſeries $\frac{2.4.6}{3} + \frac{4.6.8}{3.3} + \frac{6.8.10}{3.3.3}$ + &c. is $= 8 \times : \frac{1.2.3}{3} + \frac{2.3.4}{3.3} + \frac{3.4.5}{3.3.3}$ + &c. hence putting $n =$ the number of terms required, and $s =$ their ſum, we get, by the method of increments, $s = \frac{8nnn}{3^n}{}^{12}$, and the next ſucceeding term, or $\dot{s} = \frac{8nnn}{3^{n+1}}{}^{123} = \frac{8vvv}{3^v}{}^{12}$, putting $v = n$, hence, by examp. 14. prop. 13. Emerſon's Increments, the integral is found $= -\frac{4vvv+6vv+6v+3}{3^{v-1}}{}^{12\ 12\ 2}$ $= -81$, when $s = o$, $n = o$, and $v = 1$, hence the correct integral is $= 81 - \frac{4vvv+6vv+6v+3}{3^{v-1}}{}^{12\ 12\ 2} = 81 - \frac{6}{3^{n+1}} \times : \frac{2nnn+3n.}{\frac{2}{2}\ \frac{5}{2}\ 3\ \ \frac{7}{2}}$

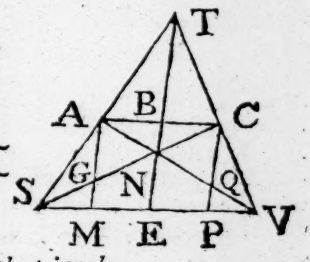
Corol. when n is infinite the ſum is $= 81$.

In this manner nearly the anſwer was given by Mr. J. Ainſworth.

Mr. Benj. Hayſon, without the method of increments, very readily finds the ſum $= 81 \times : 1 - \frac{n+2}{2} \cdot \frac{n+3}{3^{n+1}} - n. \frac{n+1}{2} \cdot \frac{n+3}{3^{n+2}} + n. \frac{n+1}{2} \cdot \frac{n+2}{3^{n+4}}$ · where n repreſents the number of terms required.

This queſtion was alſo anſwered by Mr. Todd, *and the propoſer.*

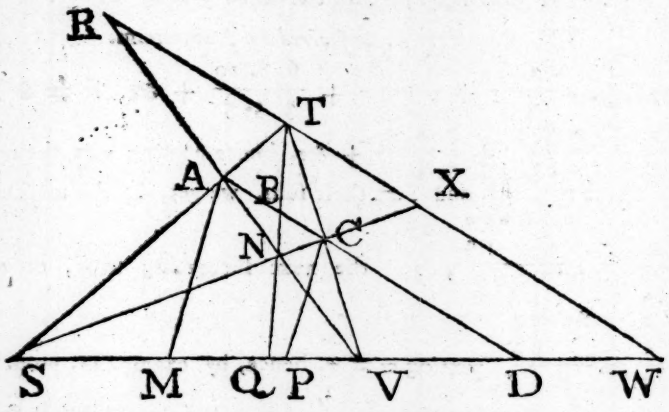
VIII. Question, *anſwered by Meſſrs.* J. Merritt, J. Ainſworth, T. Moſs, *(the propoſer) and* J. Hampſhire; *all their demonſtrations being the ſame.*



Let T N be produced to E, and draw C P, A M || thereto. Then by reaſon of the parallels and ſim. △ s, we have A M : A G :: E T : T N :: C P : C Q, and alternately A M : C P :: A G : C Q (that is, becauſe the △s A G N, C N Q are ſim.) :: A N : N Q :: A B : B C, by ſim. △ s. ∴ A M : C P :: A B : C P. *Q. E. D. The demonſtration is not materially different if the point* N *be taken without the triangle.*

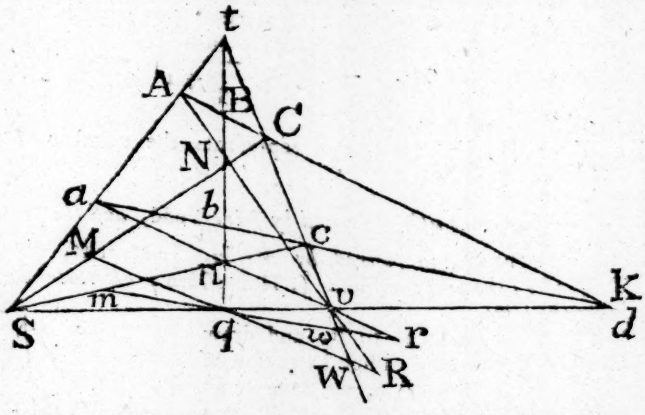
The ſame anſwered by Mr. J. Burrow.

Draw R T W through the vertex T of the triangle cutting the baſe S V in W, and S C in X; then by ſim. triangles, R T : T W :: A C



: C D, and T W : T X :: A D : A C, therefore R T : T X :: A D : D C; but R T : T X :: A B : B C, therefore A B : B C :: A D : D C; again A D : D C :: A M : C P, therefore A B : B C :: A M : C P. Q. E. D.

Let the lines be drawn as *per figure*, then from above we have $a\,b : b\,c :: a\,d : d\,c$, and $a\,b : b\,c :: r\,q : q\,m$, alſo $a\,d : d\,c :: r\,q : q\,w$ and $r\,q : q\,m :: r\,q : q\,w$, therefore $q\,m = q\,w$. Again $q\,w : d\,c :: q\,v : v\,d$, and $q\,m : d\,c :: q\,S : S\,d$, alſo $q\,v : v\,d :: q\,S : S\,d$, therefore $S\,q : q\,v :: S\,d : d\,v$.—Hence it will appear that if any two lines S C, v A be drawn interſecting in the line $t\,n$ in N and cutting the ſides in A and C, then if A C be drawn cutting S v produced it will cut it in the point d where $a\,c$ cut it before; for let it cut it in k,



then by the laſt, A B : B C :: A k : k C, and drawing W q M ‖ to A C W q may be proved equal to q M as before; and q W : C k :: $q\,v$: $v\,k$, alſo q M : C k : q S : S k, therefore $q\,v : v\,k :: q$ S : S k, but we have proved before that $q\,v : v\,d :: q$ S : S d, wherefore $v\,k$: k S :: $v\,d$: d S, and by diviſion $v\,k : v$ S :: $d\,v : v$ S, conſequently $v\,k = v\,d$.

Corol.

Corol. 1. If t S, $t v$ be two lines given in poſition, and d any given point, and if any lines d S, $d a$, d A, &c. be drawn from d cutting the lines t S, $t v$ in the points a, A, c, C, &c. and if the points S c, $v a$, S C, v A be joined then the locus of all their points of interſection n, N, &c. will be a right line.

Corol. 2. If t S, $t q$, $t v$ be three lines, and d a point taken ſo that S d : $d v$ :: S q : $q v$, then if any line whatever d A be drawn cutting the lines aforeſaid, A B will be to B C as A d to d C, &c.

Corol. 3. Hence if S v be any line, q and d points taken in it, ſo that S d : $d v$ :: S q : $q v$, and $v t$ be any line given in poſition, then if any lines $d c$, d C be drawn from d cutting $v t$ in c, C, and if S c, S C, be joined, and $q m$, q M drawn ‖ to $d c$, d C, cutting S c, S C in m and M, then will the locus of all the points m, M, be a right line ‖ to $v t$, and q will be a point equally diſtant from $v t$ and m M.

Demonſtrations were received from Meſſrs. Keech *and* Sanderſon.

IX. Queſtion, *anſwered by Mr.* Todd *(the propoſer).*

If x = years from the equated time to the laſt term, b = 6 years the time between the firſt and laſt debt D, p = 1000 *l.* r = .05, and n = 20 *l.* then *per* Malcolm, $\overline{b-x} \times pr = \frac{Drx}{1+rx}$ (from which $x = \sqrt{\frac{b}{r} + \frac{m^2}{4}}^{\frac{1}{2}} - \frac{m}{2}$ where $m = \frac{D}{pr} + \frac{1}{r} - b$) and $\overline{D+p} \times rx = n + pbr$ by the Queſt. hence $D = \frac{n+pbr}{rx} - p = \overline{bpr - prx} \times \frac{1+rx}{rx}$ from above, ſolved $x = \frac{b}{2} \pm \sqrt{\frac{b^2}{4} - \frac{n}{pr^2}}^{\frac{1}{2}} = 4$, and 2 years, and thence D = 600, and 2200 *l.* Hence this queſt. admits of two anſwers, for when x = 4 years, D = 600 *l.* and when x = 2 years, D = 2200 *l.*

Scholium. The reaſon of Malcolm's equality of intereſt and diſcount at his equated time is ſhewn thus. If p = debts paſt, due at any time after the firſt debt comes due, r = their intereſt at that time, D = debts then not due, and d = their diſcompt; then at that time the money due to the creditor = $p + r + D - d$, and when $r = d$, then $p + D$ = debt due to the creditor; for at that time the intereſt and diſcompt become equal and contrary, deſtroy, or vaniſh out of the queſtion, which can only happen at Malcolm's equated time.

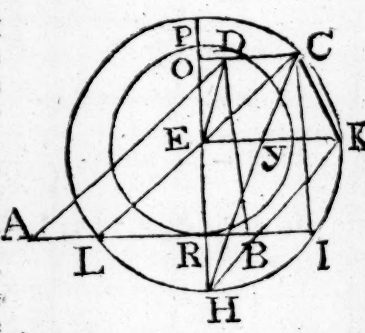
Perhaps it may not be improper to remark that Malcolm's double ſign $\pm$ put in his theorem for the equated time, is not right, becauſe it may be proved that in every caſe the negative ſign will obtain. Alſo, his direction for finding the equated time when there are more debts than two is alſo falſe on his own hypotheſis, as may be eaſily proved by trial. Is it not therefore ſurprizing that moſt of our arithmetical writers ſince his time, ſhould ſo exactly copy theſe errors into their books as known truths? It is the old method only (long in uſe before Sir S. Morland's time) that gives the ſame advantage to the creditor in the whole time, as by the equated time, allowing ſimple

intereſt; whereas Malcolm's method always gives more money to the creditor, as is ſhewn above, than could be made by receiving the debts as they become due.

Mr. Dalby *gives a ſolution as follows:* Put $a = 1000$, $r =, 05$, the rate of intereſt; $n = 6$ years, and $x =$ the equated time after the firſt payment is due; then will $a\,r\,x$ be the intereſt of a for x time; now to gain any advantage by receiving theſe payments according to Malcolm's rule, (let D be what it will) this intereſt muſt be made uſe of as a principal; and its intereſt for $n - x$ time in the preſent caſe $= 20\,l.$ that is $a\,r^2\,n\,x - a\,r^2\,x^2 = 20$, in numbers $15\,x - 2\frac{1}{2}\,x^2 = 20$, hence $x = 2$, and 4, for the equated times; and the ſums whoſe diſcounts for the remaining 4 and 2 years, are equal to the intereſts of a for thoſe times are $600\,l.$ and $2200\,l.$ for the values of D.

X. Question, *anſwered by Mr.* John Hampſhire.

Conſtruc. Let R P be the given circ. E its cent. $\perp$ to the diam. R P take R I, R L each $= \frac{1}{2}$ the given ſegm. of the tang. and on L I deſcribe a circ. to contain the given $\angle$, draw E K $\parallel$ R I, and join K H, then by Simpſon's Geom. 5. 18. take H C ſo that $\overline{HY + N} \times HY = HK^2$ (N being the biſecting line, or diſt. of E from the given $\angle$) draw C L, C I; alſo C O $\parallel$ E K, E D $\parallel$ C Y, D A, D B $\parallel$ C L, C I; and the thing is done.

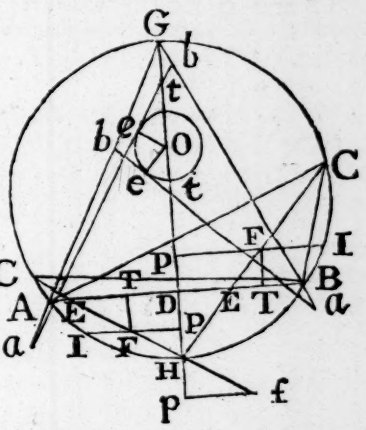


For join C K, then becauſe the $\angle$ E K H $=$ H K C, and the $\angle$ C H K common, the $\triangle$s C H K, K H Y are ſim. and ſo H C : H K :: H K : H Y, but H Y + N : H K :: H K : H Y (by conſt.) hence by equality, H C $=$ H Y + N, $\therefore$ C Y $=$ N; and by conſt. the $\angle$ L C I $=$ the given $\angle$, and the $\triangle$s L C I, A D B ſim. and equal $\therefore$ D E $=$ C Y $=$ N, and A B $=$ 2 L R.

The ſame anſwered by Mr. George Sanderſon.

Conſtruc. On A B the given ſegment of the tang. deſcribe the ſegment of a circ. to contain the given $\angle$, draw the diam. G H $\perp$ A B, and take G O $=$ the diſt. of the cent. of the given circle and $\angle$ made by the lines given in poſition, about the cent. *o* deſcribe the given circ. take D P $=$ O *e* the rad. and draw P I $\parallel$ A B; from H draw H C cutting P I in F and A B in E ſuch that F C $=$ G O, then draw the rad. O *e* $\parallel$ C H, and laſtly draw the tang. *b e a* to meet or cut G A and G B (produced if neceſſary) in *a* and *b*, and G H in *t*, and the thing is done.

Demonſtra.



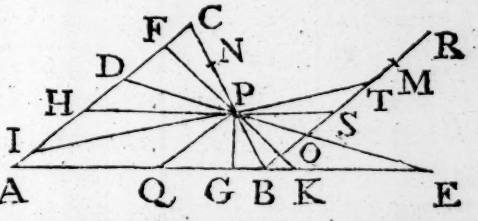
Demonſtra. Join A C, and B C, and draw F T ⊥ A B: then becauſe G H is ⊥ A B, A D is = to D B and the ∠s A G H, B G H, A C H and B C H are equal to half the given ∠, but *e* O is || F E, and F T || H G, and F T = *e* O (by conſtruc.) ∴ F E = O *t*, and the ∠ F E T = O *t e*; but G O = C F (by conſtruc.) ∴ G *t* and C E are equal, but as the △s G *t a*, G *t b*, C E A and C E B have two ∠s in one equal to two ∠s in the other, and G *t* = C E, conſequently they are equal in all reſpects; therefore *a b* = A B as required.

Limitation. When G O is = to the upper P G, or the cent. O falls in the upper P, A B is manifeſtly a *minimum* tang. to the lower part of the circ. but when O falls in the lower P then it is a *minimum* tang. to the upper part of the circ. Again, when D P ⊏ D H or P falls without the circ. as at *p*, the given diſt. G O muſt be drawn through H to meet the circ. in C. and a line drawn || A B as in *f*: Moreover, when the circ. O *e* touches or cuts the lines given in poſition, then G H ✱ H P cannot be greater than a ſquare on half G O, a *maximum* limit for the tang. on the upper part of the circle in that caſe, the lower being infinite.

The propoſer Mr. J. Ainſworth, *has given a moſt elegant conſtruc. to all the caſes: we are ſorry our limits will not permit us to inſert his ſolution. A conſt. was alſo given by Mr.* Keech.

XI. QUESTION, *anſwered by the Rev. Mr.* Crakelt, *the propoſer.*

Conſt. Draw P H || A B, and let fall the ⊥s P F, P G upon A C, A B, and having made the △ I C P = trapez. A I P B (that is the △ I H P = half the diff. of the trapez. A H P B and △ H C P) through B draw B R || A C meeting H P, I P produced in S, and T; this done, take P N a fourth proportional to 2 P F, P G and P S, and T M a fourth propor. to P H, P S and P N; then having divided B M in O ſo that M O × S O = T M × B S, through P O, draw D E, andthe thing is done.



Demonſt. Since by conſtruc. M O : T M :: B S : S O, therefore, by diviſion and ſim. △s, will T O : T M :: B O : S O :: B E : P S, or by *Euc.* 6. 1. T O × P H : T M × P H :: B E × P N : P S × P N = T M × P H, by conſtruction; conſequently, *Euc.* 6. 1. T O : B E :: P N : P H: but by ſim. △s, I D : T O :: P I : P T :: P H : P S; wherefore, *ex æquo perturbati*, I D : B C :: P N : P S :: P G : 2 P F by conſtruction; and hence B E × P G = I D × 2 P F, or the △ P B E

P B E = 2 △ P I D. Now, by conſtruction the △ P I C = trapez. A I P B; wherefore, by adding the △ P I D, twice the △ P I D with the △ P C D, that is, the △s P C D and P B E, will be equal to the trapez. A D P B.

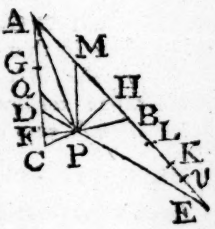
The ſame anſwered by Mr. G. Sanderſon. *See the preceding figure.*

Conſt. Draw P H, P Q || A B, A C reſpectively, then if the △ H C P ⌐ trapez. A H P B, make △ B P K = the diff. then produce Q K till Q E × K E = 2 H P² (2 A Q²) laſtly, from E draw E P D and the thing is done. For letting fall the ⊥ P G; the △s Q P E, H D P are ſim. ∴ Q E² : 2 H P² :: △ Q P E : 2 H D P (*Simp.* Geom. 26. 4.) that is Q E² : Q E × K E :: Q E × P G : 2 H D P :: Q E : K E :: Q E × P G : K E × P G ∴ K E × P G (△ K P E) = 2 H D P; but △ H D P + D P C (△ H P C) + B P K = trapez. A P B H, (conſtruc.) add to both △ H D P, then △ H D P + D P C + E P K = A H P B + H D P (= A D P B) but 2 H D P has been proved to be = P K E, ∴ K P E + B P K (= B P E) + D P C = A D P B as required.

When △ H C P ⌐ trapez. A H P B, the diff. muſt be ſet off on the other ſide of B.

The ſame anſwered by Mr. Jer. Ainſworth.

Analyſis. Draw P F, P F ⊥ and P M, P Q || to A C and A B; and biſect A C in G: alſo make B K = B A and draw P A. Then by the nature of the queſtion the △s P E B — P A B = P D A — P D C, conſequently 2 P F × D G = P H × K E, or 2 P F : P H :: K E : D G, in which ratio therefore take L E to A D, then 2 P F : P H :: L E : A D, hence this *conſt.* Take L *v* = 2 A M, and make M E × E *v* = A M × L *v*, and E P D will be the line required. For ſince M E × E *v* = A M × L *v*, or E *v* : L *v* :: A M : M E, by compoſition L E : L *v* :: A E : M E (that is, by reaſon of the ||s) :: A D : P M, and alternately L E : A D :: L *v* : P M; but 2 P F × P M = twice the parallelogram P M A Q = 2 A M × P H = L *v* (2 A M) × P H, or L *v* : P M :: 2 P F : P H; therefore 2 P F : P H :: E L : A D.



A conſtruc. to this Queſt. was given by Mr. Keech; *and an algebraic ſolut. by Mr.* Woolcott.

*** *We have received many ingenious anſwers to the Prize Queſtion, but as ſeveral of our Correſpondents are of opinion that it admits of a Geometrical ſolution, we ſhall, at their requeſt, defer giving any 'till another Year.*

ARTICLE XIV.

A Specimen of a Method of finding Rules for the Extraction of Roots. By Reuben Burrow.

LET N be the number whoſe root is required, $a + x$ its root and a^n the neareſt power to N, and let A and B be indeterminate coefficients.

Aſſume

Aſſume $a : a + x :: A a^n + B N : \frac{\overline{a+x} \times A a^n + B N}{a} =$

$\frac{\overline{a+x} \times A a^n + B \times \overline{a+x}^n}{a} = \frac{\overline{a+x} \times A a^n + B \times \overline{a+x}^{n+1}}{a}$

$= (A+B) a^n + (n+1 \times B + A) a^{n-1} x + \frac{n+1 \cdot n}{2} . B a^{n-2} x^2$

$+ \frac{n+1 \cdot n \cdot n-1}{2 \cdot 3} . B a^{n-3} x^3 +$ &c. Then let ſuch values be aſſumed for A and B as may make this laſt expreſſion conſiſt of parts or multiples of the given quantities a^n and N, or nearly ſo, and then the firſt, third and laſt terms of this proportion being given; the ſecond will be found by proportion, nearly.

Example. Let $n = 2$, $A = 3$, $B = 1$, then $\frac{\overline{a+x} \times A a^n + B N}{a}$

$= 4 a^2 + 6 a x + 3 x^2 + \frac{x^3}{a} = a^2 + 3 a^2 + 6 a x + 3 x^2$ nearly,

or $a^2 + 3 (a^2 + 2 a x + x^2) = a^2 + 3 N$; Wherefore $3 a^2 + N : 3 N + a^2 :: a : a + x$. Hence the following rule for extracting the Square Root. *Find the neareſt ſquare to the given number whoſe root is required, then thrice the neareſt ſquare, added to the given number, is to thrice the given number added to the neareſt ſquare, as the root of the neareſt ſquare, to the root required, nearly.*

Ex. Let the ſquare root of 2 be extracted; Here $N = 2$, aſſume $a = 1,5$ then $a^2 = 2,25$ &c. $8,75 : 8,25 :: 1,5 : 1,4142$; then repeating the operation $a = 1,4142$ and $a^2 = 1.99996164$ &c. 7.99988492 $7.99996164 :: 1.4142 : 1.41421356237309947$ which is true to 16 places, and only errs 2 in the laſt figure, which ſhould be a 9.

In order to get a rule for extracting the cube root, let $n = 3$, $A = 2$ and $B = 1$, then $\frac{\overline{a+x} \times A a^n + B N}{a} = 3 a^3 + 6 a^2 x + 6 a x^2$

$+ 4 x^3 + \frac{x^4}{a} = a^3 + 2 (a^3 + 3 a^2 x + 3 a x^2 + 2 x^3) = a^3 + 2 N$

nearly, by rejecting x^3 and $\frac{x^4}{a}$ which are very ſmall. Hence the following rule for *extracting the Cube Root.*

Find the neareſt cube, to the given number whoſe root is required; then twice the neareſt cube, added to the given number, will be to twice the given number added to the neareſt cube, as the root of the neareſt cube, to the root required; then if this laſt quotient be aſſumed as the root of the neareſt cube and the operation repeated, the root may be found to any exactneſs requiſite.

Cor. 1. Another approximation for the cube root may be had by ſubſtituting 5 for A and 1 for B, but not ſo exact as the above.

Cor. 2. Becauſe $3 a^2 + N : 3 N + a^2 :: a + \frac{1}{3} N : N + \frac{1}{3} a$

therefore

therefore $a + \frac{1}{3}N : N + \frac{1}{3}a :: a : a + x$ and this rule is the mo convenient for extracting the ſquare root when the given number wi divide by 3; and the ſame for others.

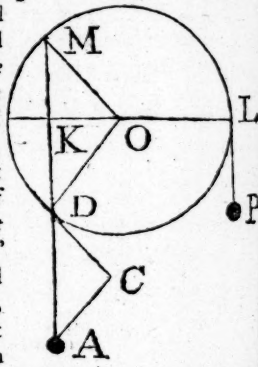
Cor. 3. Alſo becauſe $2a^3 + N : 2N + a^3 :: a^3 + \frac{1}{2}N : N + \frac{1}{2}$ therefore $a^3 + \frac{1}{2}N : N + \frac{1}{2}a^3 :: a : a + x$ which brings out th cube root in fewer figures when the given number is diviſible by 2. &

ARTICLE XV.

Remarks on ſome Criticiſms concerning the Property of the L ver, &c. *by* Reuben Burrow.

HAPPENING lately to meet with a volume of Philoſophic Eſſays, publiſhed in 1766, by that excellent Geometrician D Hamilton, Profeſſor of Philoſophy at Dublin, wherein are ſever objections made againſt Sir Iſaac Newton's proof of the property the Lever, I made enquiry whether theſe objections had ever bee refuted? and being anſwered in the negative, I have taken the liber of pointing out where I apprehend the Doctor is miſtaken.

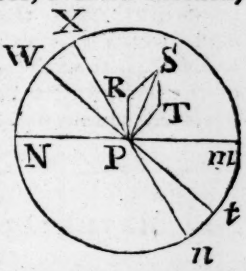
In the ſecond corollary to the third law, Newton aſſumes tw principles as ſelf-evident; one of which is, that equal and contra forces acting perpendicular to any two radii of a wheel at equal di tances, will prevent it from turning about its center; the other i that any weight A ſuſpended by a cord faſtened at D will ha the ſame force in the direction D A as it would have if faſtened any other point in that line. The firſt of theſe is very eviden and the laſt remarkably ſo; for as the weight A is here the on force that acts in the direction D A, and as that remains the ſame whether the cord be faſtened at D or at K conſequently *the force in the direction* D A is not in the leaſt varied, whatever part of the line D M may be aſſumed for the point of ſuſpenſion. —This is all that Newton ſuppoſes; but Dr. Hamilton ſeems to underſtand it, as if Newton had aſſumed for a principle "*that "the force to turn the wheel about its axis,*" was the ſame whether the cord was faſtened at D or at K; that it is ſo there is no doubt, but that only follows as a corollary and is not at all pre-ſuppoſed in the demonſtration which



proceeds totally independent of that conſideration, and requires only thi ſelf-evident aſſumption, "that the force in the direction D A i "the ſame, whether the ſtring be faſtened at D, K or M." Thus le there be given the weight L P acting perpendicular to L O at L, an the force be required which acting ⊥ to O K at K will balance it Now by the firſt aſſumption if O D = O L it muſt be a force D = L P which acting perpendicular to D O will balance L P; but

the force required is to act in the direction D A, by corollary 1, K D A muſt be perpendicular to K L, and C A to C D, in order to find the force D A, which, acting in the direction D A, will be equivalent to D C in the direction D C, now D C : D A :: O K : O D, therefore L P : D A :: O K : O L and therefore the lengths of the arms are reciprocally as the weights.

It may not be amiſs to annex here a few eaſy corollaries to the 1ſt and 3d laws of motion. Let N X *m n* P be a globe, N X *m n* a ſection, through its center, and P a point where the diameter, perpendicular to the plane N X *m n*, meets the ſurface; and let P T, perpendicular to this diameter, repreſent the globes velocity about the axis X *n* and P R in the ſame plane with P T, repreſent the velocity about the axis N *m*; then the globe will revolve about a new axis in the ſame plane with X *n* and N *m*: for the line P S which repreſents the velocity compounded of P T and P R, or the velocity with which the globe revolves about the new axis, lies in the ſame plane with R P and P T; but the axis of revolution lies in a plane paſſing through the center parallel to this plane, and its direction is perpendicular to that of the tangent P S: Hence, N P R = X P T = W P S wherefore R P T = N P X, S P T = W P X, and N P W = R P S; let V = P T = R S. *v* = P R = S T; then P R : P T (R S) :: *s.* P S R : *s.* R P S; that is *v* : V :: *s.* W P X : *s.* N P W; wherefore the velocity about the axis N *m* is to the velocity about the axis X *n*, reciprocally as the ſines of the angles N P W and W P X made with the new axis W *t*. Again, P R : P S :: *s.* P S R : *s.* P P S = *s.* R P T = *s.* N P X, that is, P R : P S :: *s.* X P W : *s.* X P N; alſo P T : P S :: *s.* N P W : *s.* X P X. Hence if *x* be put to repreſent the velocity P S, V : *v* : *x* :: *s.* N P W : *s.* W P X : *s.* X P N :: P T : P R : P S.



The above is not reſtricted to globular bodies only, but is equally applicable to planes and ſolids of different kinds, and may be of uſe in ſeveral branches of philoſophy, particularly in determining the proceſſion of the equinox, &c. and what is done above for two forces may be applied to any number in the ſame manner as is uſually done in compoſition and reſolution of forces on the ſame or different planes.

ARTICLE XVI.

An eaſy method of determining experimentally the Curve which a ſhell deſcribes in its flight. By Reuben Burrow.

THOUGH the method of determining the curve which a military ſhell actually deſcribes be difficult from theory, yet it is ſo eaſy in practice that I ſhould ſcarcely have thought the following worth inſertion, had not Captain Williams of the Royal Artillery publickly propoſed

poſed the thing as a queſtion of ſome importance, and afterwards ſolved i himſelf by a way which cannot be true in theory and muſt be of in ſuperable difficulty in practice.—The method I would propoſe, is b means of an inſtrument for drawing perſpective views (which was in vented by Sir Chriſtopher Wren and publiſhed in the Philoſophica Tranſactions; and afterwards re-invented and improved by Gilbe Watt) namely by placing this inſtrument parallel to the range of th mortar, and when "*live* ſhells" are fired, to keep that point of the inſtru ment intended to trace outlines continually between the eye and th ſhell (which may eaſily be done as ſhells do not move quick and ar eaſily ſeen) then the pencil will deſcribe a curve exactly ſimilar to tha of the ſhell, for the ſame reaſon that the ſections of a cone cut parall to its baſe are ſimilar.

New MATHEMATICAL QUESTIONS *to be anſwered in nex Year's* DIARY.

[1] XXVI. QUESTION, *by Mr.* Tho. Hatton.

GIVEN $\left.\begin{matrix} x^2+xy+y^2=a \\ x^4+x^2y^2+y^4=b \end{matrix}\right\}$ required x and y.

N. B. This Queſt. was propoſed in Martin's Mag. but admits of a neate ſolution than is there given.

[2] XXVII. QUESTION, *by* Amuneim.

TO find two numbers ſuch that the ſum or diff. of their ſquare leſſened by unity ſhall in each caſe be a rational ſquare.

[3] XXVIII. QUESTION, *by Mr.* Will. Hardy.

LET there be two right angled triangles B D A, C Q A whoſe hy pothenuſes A B, A C are given and meet in the point A makin a given $\angle$ B A C; tis required to determine the triangles when th baſes D A, A Q are in a right line, and the inſcribed circles equal t each other.

[4] XXIX. QUESTION, *by Mr.* Simon Woolcott.

REQUIRED the area of that curve whoſe equation i $\dot{y}=\frac{a\dot{x}}{\sqrt{a^2-x^2}}+\frac{x\dot{x}}{\sqrt{a^2-x^2}}$.

[5] XXX. QUESTION, *by Mr.* Tho. Todd.

SUPPOSE a gentleman to give his ſons A and B equally betwee them, a pounds payable in 1 year, $2a$ in 2 years, $3a$ in 3 years and ſo on for ever: but the ſons having agreed between themſelves that A ſhall have the 1ſt annual payments, and B and his heirs ſhal have the reſt after him: required x years the time in which A wil receive his payments, allowing 5 per cent. per annum compound inte reſt to both A and B.

[6] XXXI. QUESTION, *by Mr.* Benj. Hayſon.

TO find the locus of the centers of an infinite number of circle touching two other circles given in magnitude and poſition.

[7

[7] XXXII. QUESTION, *by* Aumuneim.

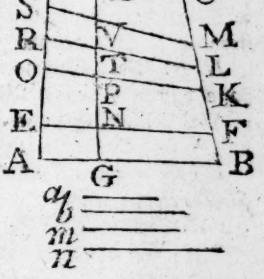
LET A B be a ſemicircle, B C a tang. thereto equal to the diam. A B, and let C P, C *p*, &c. be lines drawn from C to meet the diam. A B in P, *p*, &c. alſo let P Q, *p q*, &c. be ⊥ A B, and meet the circumf. in Q, *q*, &c. and let Q E, *q e*, &c. be drawn ⊥ C P, C *p*, &c. and meet C P, C *p*, &c. in E, *e*, &c. 'tis required to find the locus of the points E, *e*, &c.

[8] XXXIII. QUESTION, *by the late Mr.* Will. Wilkin.

REQUIRED a general theorem for finding the ſum of *n* terms of the following ſeries, $1 \cdot 2^2 \cdot 3^3 + 3 \cdot 4^2 \cdot 5^3 + 5 \cdot 6^2 \, 7^3 \cdot + 7 \cdot 8^2 \cdot 9^3 +$ &c,

[9] XXXIV. QUESTION, *by Mr.* Tho. Moſs.

IF the diſtance of two points A and B, and the poſition of the two indefinite lines A D and B C be given, and a right line E F be ſo drawn that the parts B F and A E may be in any aſſigned ratio of *a* to *b*; and the two lines A B and E F be divided in G and N in the given ratio of *m* to *n*; that is, A G to G B (and E N to N F) as *m* to *n*; and let the indefinite line G N Q be drawn, and an indefinite number of points K, L, M, &c. and O, R, S, &c. be reſpectively taken in the lines B C and A D, ſuch that B K may be to A O, B L to A R, and B M to A S, &c. always in the ſame given ratio of *a* to *b* (or B F to A E) and the lines O K, R L, and S M, &c. be drawn: then will theſe laſt mentioned lines be always divided by the line G N Q in the ſame given ratio of *m* to *n*; that is, O P is to P K, R T to T L, and S V to V M, &c. in the given ratio A G to G B (or E N to N F) required a demonſtration thereof from geometrical principles.



[10] XXXV. QUESTION, *by the Rev. Mr.* Lawſon.

GIVEN the vertical angle and the baſe, to determine the triangle when the rectangle of the ſides is equal to the difference of their ſquares.

[11] XXXVI. QUESTION, *by the Rev. Mr.* Crakelt.

GIVEN the vertical angle, the difference of the baſe and one of the ſides, and the perimeter; to conſtruct the triangle.

[12] XXXVI. QUESTION, *by Mr.* George Sanderſon.

GIVEN the baſe, the difference of the ſides, and the line biſecting the vertical angle of a plane triangle to conſtruct it.

[13] XXXVII. QUESTION, *by Mr.* Iſaac Dalby.

HAVING given two plane angles, it is required to find another plane angle, ſo that the three being joined, the two firſt may make a given ſolid angle.

[14]

[14] XXXVIII. QUESTION, *by Mr.* Reuben Burrow.

HAVING two curves of any kind given in position, it is required to draw a line parallel to a line given in position, so that the part intercepted between the two curves may be of a given length.

[15] XXXIX. QUESTION, *by Mr.* George Beck.

SUPPOSE a triangle parallel to the horizon, and revolving equably in the direction of its plane, was to fall downwards, required the nature of the solid described thereby.

PRIZE QUESTION, *by the Rev. Mr.* Crakelt.

IF from one of the extremities of a given quadrant, four arches be taken in such a manner, that the difference of the two first arches, may be equal to the difference of the two last; then will the ratio of the tangents corresponding to the two first of the said arches be equal to, greater or less than, the ratio of the tangents corresponding to the two last arches, according as the first of the aforesaid differences is at the same, a greater or less distance from the middle of the quadrant, with or than the latter difference: Required the geometrical demonstration of this property.

N. B. This Question is, in effect, the same with that proposed on page 197 of *Maseres*'s Trigonometry, the solution of which takes up several following pages in that work, and is at last given up as not to be effected by reasoning purely geometrical.

Whoever gives the best Solution to this Question before Candlemas-day, *shall receive a Prize of Twelve* Diaries, *and the next best a Prize of Six* Diaries.

*** We hope our ingenious Correspondents will excuse any errors or omissions in this Diary, the Author being for some months past engaged on duty at Languard-Fort, and therefore unable to attend the publication, but intends in the next, to give additions and corrections to all the Errata in this, and the preceding Diaries.